AMERICAN MACHINIST

NOVEMBER 12, 1942

How Kaiser Builds Liberty Ships—Page 1299

A Machine Tool's Best Friend!

54 Heald service men keep 'em producing

3. Maybe you didn't know that your maintenance force has been increased lately. But it has — if you have Heald Precision Boring and Grinding Machines in your shop. When you installed that last Heald machine you added another man to your factory personnel — the Heald Service Man. He's not on your payroll, but just the same he's working for you — helping to keep your Heald producing more and producing longer. He reports for work when your Heald is first installed, setting it up to function at peak efficiency, and instructing your man to operate it that way. After that he'll be on the job periodically giving the machine a careful check-up. In case serious trouble should develop, a telephone call to the nearest Heald branch office will get him back on the job—and the machine, too. He knows that in serving you he's serving America.

ARMY E NAVY

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Keeps Production Rolling

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2. Factory Engineering Service
3. Demonstration and Maintenance Service

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MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES

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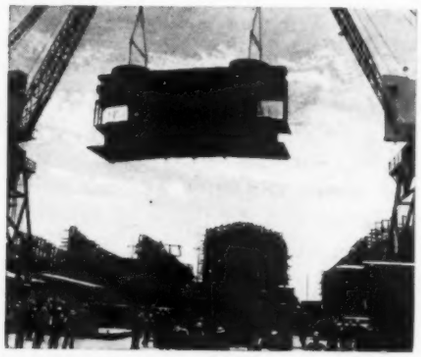

Kaiser Built — Shipbuilding records depend on prefabricating subassemblies before they are taken to the ways

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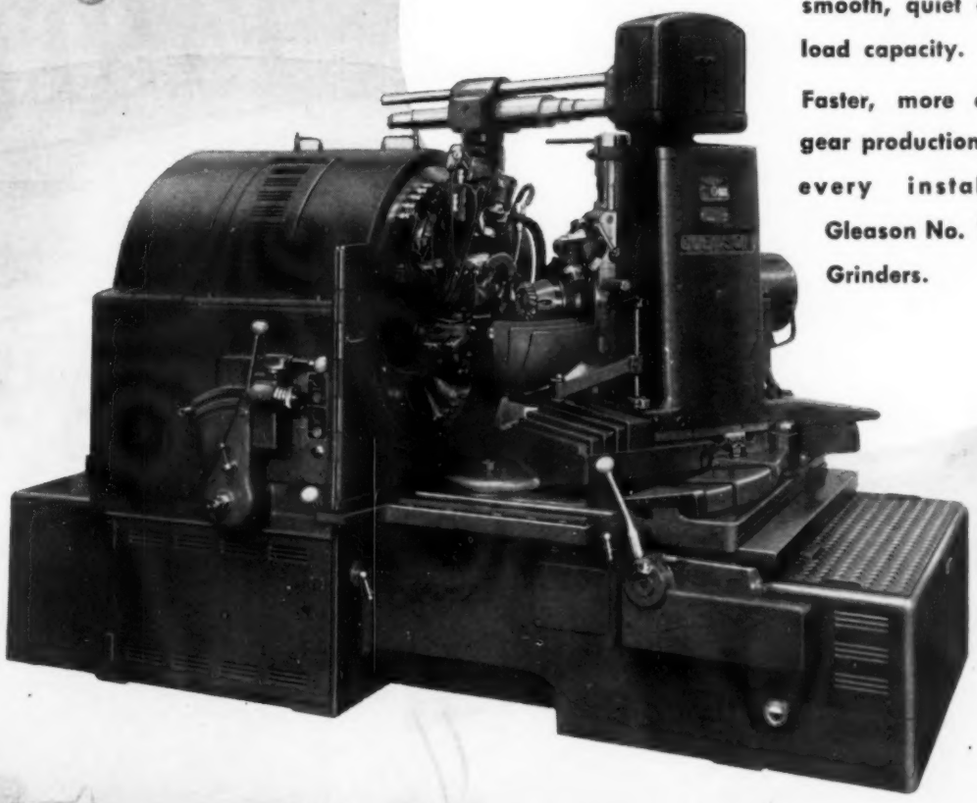

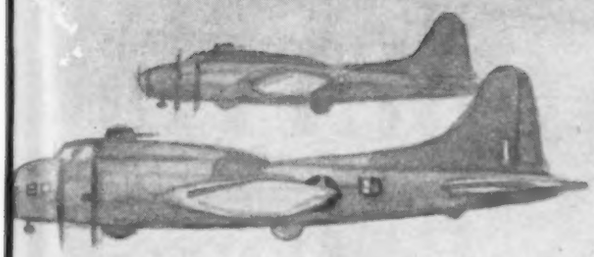

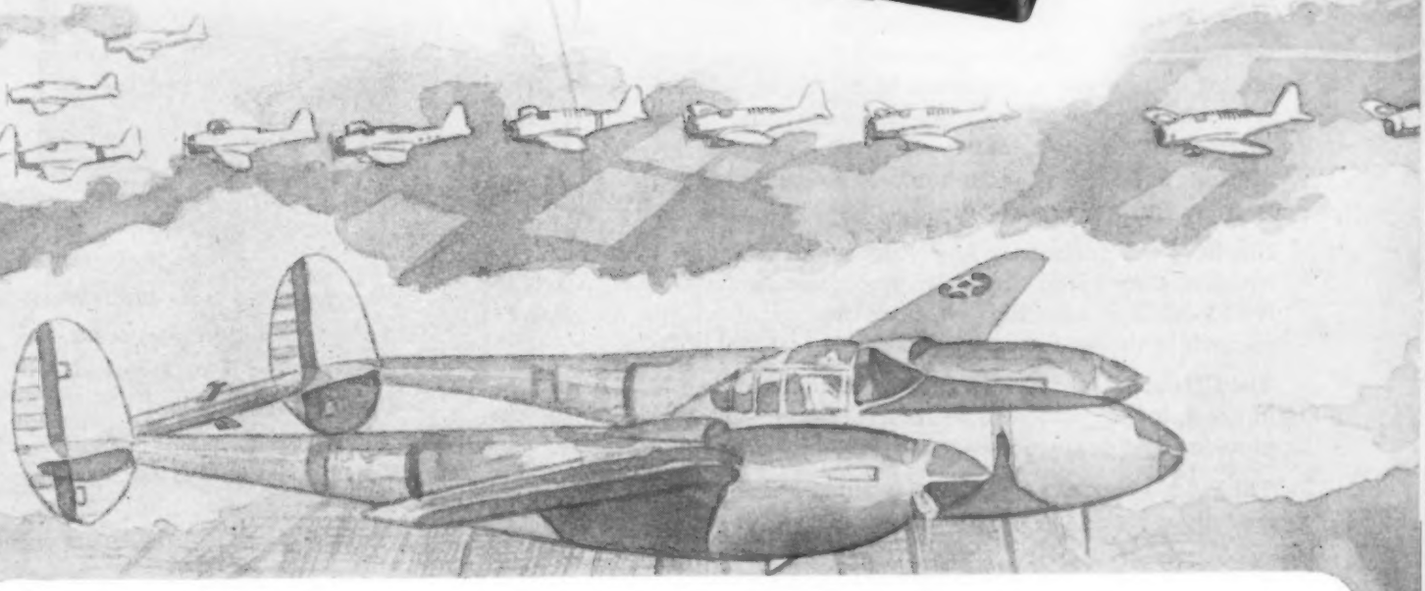

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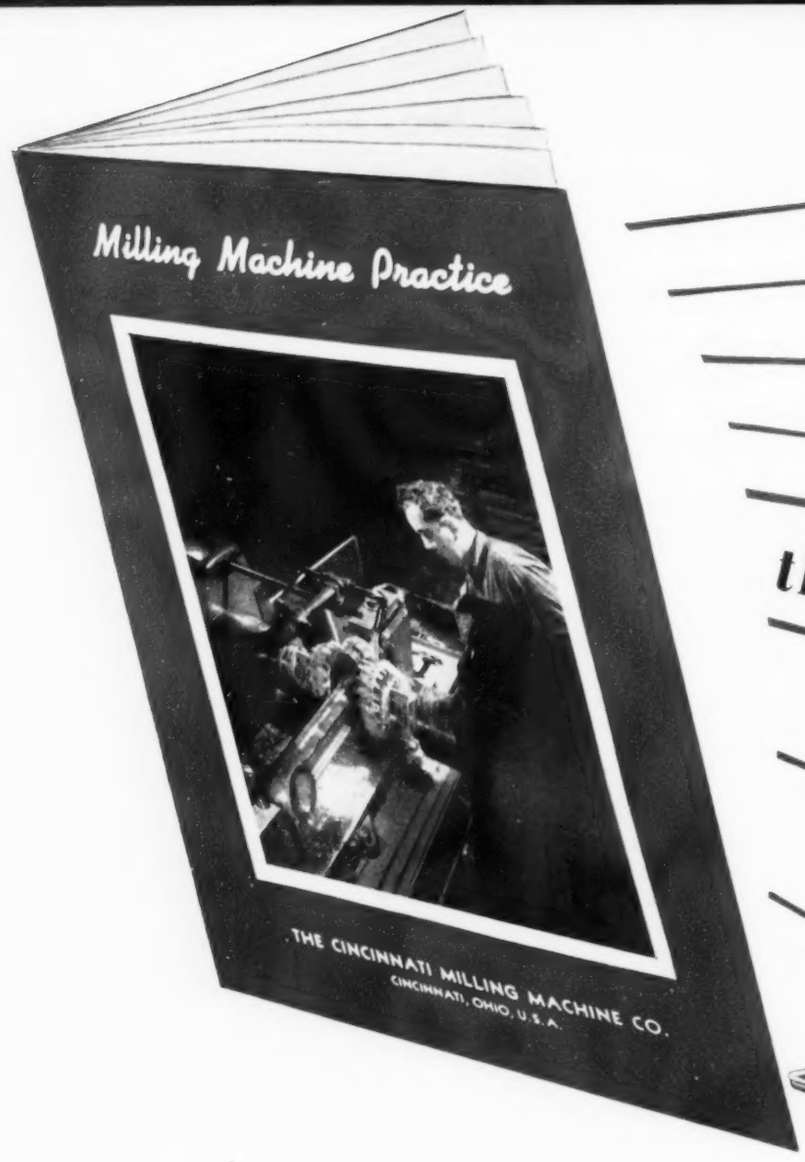
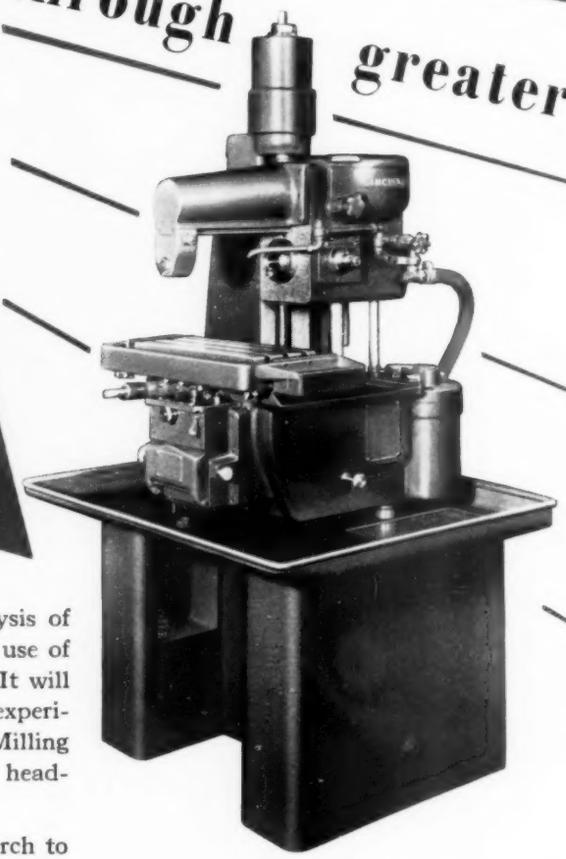


BETTER FASTER through greater



Illustrated above is the CINCINNATI No. 0-8 Plain Automatic Milling Machine equipped with Automatic Rise and Fall Spindle Carrier.

Send for this booklet. Within its pages you will find an analysis of the processes of milling — classification of milling cutters — the use of milling cutters, and a discussion of milling machines by types. It will give your new operators a start in the right direction and your experienced men a more complete understanding of their work. "Milling Machine Practice" is another official communique from milling headquarters and is yours for the asking. Send for your copy today.

Nor have we confined the knowledge gained from constant research to booklets alone. Into the design and construction of every CINCINNATI Milling Machine has gone the result of this never-ending research in the field as well as in the laboratory.

The CINCINNATI No. 0-8 Plain Automatic Milling Machine is a case in point, for it embodies late engineering principles which combine to provide rapid production with better than average accuracy.

The 0-8 has special advantages for milling small intricate parts. These are fully explained in specification catalog M-964. Send for your copy.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

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THE CINCINNATI

TOOL ROOM AND MANUFACTURING

MILLING

. . .

knowledge

MILLING MACHINE PRACTICE

Symbols Indicated in Figure 1

F — Feed Rate
d — Depth of Cut
f_t — Feed per Tooth
α — Angular Displacement
β — Clearance Angle
ϕ — Rake Angle

Figure 1

will vary with changes in rate of feed, diameter of cutter, depth of cut, and cutting speed. Figure 1 shows that the actual rake and clearance angles change continually as the tooth forms a chip. In upmilling, the actual clearance angle is a minimum value of β_1 when the tooth contact is at the beginning of the cut, increasing to maximum value of β_2 when the tooth leaves the work. In down-milling, the actual clearance angle is least at the beginning of the cut and greatest at the end of the cut. The actual rake angle α is greatest at the beginning of the cut and least, α_1, at the end.

In this respect, milling differs radically from other machining processes, as turning, planing, etc., in which clearance and rake angles remain constant throughout the cut.

Chip Formation. Upmilling and down-milling produce surfaces of entirely different character. The reason lying in the nature of the process of chip formation. When a cutting tool engages a work piece, the material immediately ahead of the cutting edge is at first compressed, and then suddenly shears off as a chip. See Figure 2. As the tool continues to advance, however, escape in this form becomes increasingly difficult; the pressure on the tool rises, the stress in the material ahead of the tool increases, finally reaches a value great enough to cause rupture or flow in a plane roughly parallel to the face of the tool. If the material is relatively brittle, or the thickness of chip is great, a definite rupture will occur in this plane. The entire portion of several thousandths of an inch in thickness of the material then will move out of the work as a fresh surface, but the remainder of the advancing tool and permit the path of the cutting edge will move out of the work as a continuous ribbon, but a series of individual segments more or less closely joined. This type of chip is known as a segmental chip.

— 4 —

MILLING CUTTERS

If the material is relatively ductile, definite successive ruptures will not take place; instead, the material ahead of the tool will yield by plastic flow over a broad region. As this material (A, Figure 3) is forced out of the path of the advancing tool, it separates from the initially compressed portion, B, which is held by friction against the tool face. The body of the chip passes off as a ribbon, with fine lines perpendicular to the tool face. The solid portion, B, with these lines parallel to the tool face. The resulting chip is a so-called built-up edge. This type of chip remains to form the actual cutting edge, and thereafter is generally is formed into a wedge-shaped built-up edge. The built-up edge is added to continuously by material compressed at point C but is periodically reduced by fragments as D and E, torn off both the chip and work piece, respectively.

Roughness of a machined surface is due solely to the presence of fragments such as E; consequently, to secure a good finish, these should be kept to a minimum by so arranging conditions that the stable size of the built-up edge itself is a minimum. Such arrangements include: 1. Increase in tool sharpness, 2. Increase in rake angle. 3. Use of cutting fluid. 4. Increase of cutting speed. 5. Use of tool material of lower thermal conductivity. (See Influence of Work Material on Cutting Temperature and Tool Life, by O. W. Boston and J. E. Kunz, Trans. A. S. M. E., Vol. 57, 1935, pp. 109-123; also An Analysis of the Milling Process, by M. Martellotti, Trans. A. S. M. E., Vol. 63, No. 8, Nov., 1941, pp. 677-700.)

Figure 3

In up-milling, the portion of the finished surface which is produced by a tooth is formed at the beginning of its contact with the work piece, when the chip thickness is extremely small. Hence, the resulted surface is very small, and the tool-up edge itself is very small, and the resulted surface is smooth and shiny. In down-milling, the portion of the finished surface which is produced by a tooth is formed at the end of its contact with the work piece, when the chip thickness is extremely large. Hence, the resulted surface is relatively rough and dull. With a ductile material such as a low-carbon steel, where the built-up edge is large, the cutter persists to the extreme end of the chip; thus the cut-up edge is relatively large, and produces a somewhat rough surface. Likewise, the built

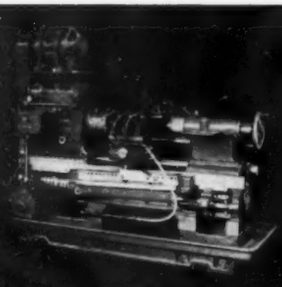
Toss him a blossom!

He's been gathered to his ultimate reward these many years, God rest his soul, but he was a fine man in his time. He was the strongest man that ever lived. He once astounded the civilized world by supporting a platform loaded with 6,370 pounds of stone — a matter of biceps calling for nigh unto 10 horsepower, according to the sidewalk statisticians.

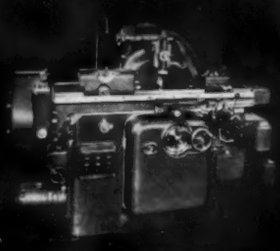
And that was in the days when horsepower was seldom found outside of harness . . . but then all things change. Take that matter of power, for instance.

Today they're building cargo planes that will lift whole carloads of freight and set it down thousands of miles away. And a giant turbine generator develops power enough to lift 100 million pounds, or light half a million homes.

For new and exciting chapters in the story of power are being written today. And inseparably a part of that story, from the very beginning of the Industrial Age, are the machine tools designed and developed by Jones & Lamson during more than a century of American progress.



FAY AUTOMATIC LATHES



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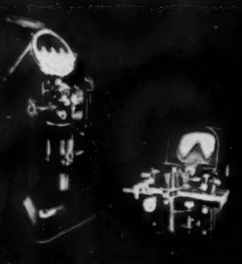

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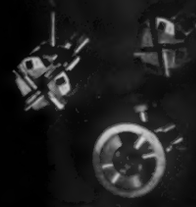

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It is because of this background and reputation that American manufacturers — from the largest to the smallest — have called upon Jones & Lamson many thousands of times for counsel, service, or precision machine tools during a single year of this war.

No matter what your problem — or when — Jones & Lamson engineers and service men are likewise at your call.

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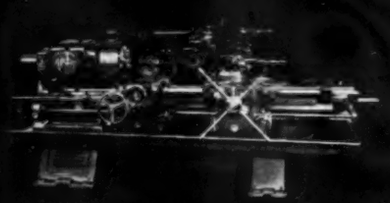
Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

Springfield, **Vermont, U. S. A.**



SADDLE TYPE
UNIVERSAL TURRET LATHES

PROFIT-PRODUCING
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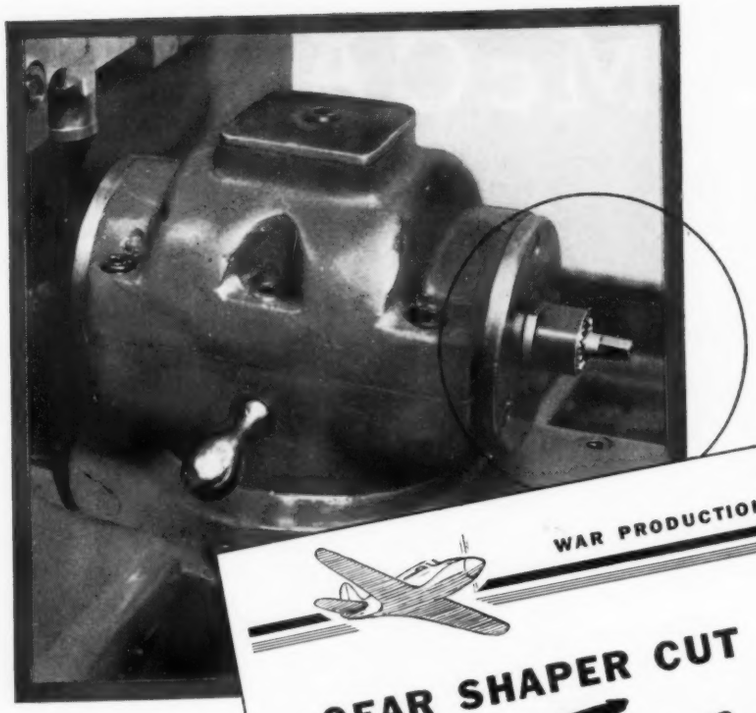
"DOUBLE-

EXEMPLIFIES



WAR PRODUCTION BULLETIN

GEAR SHAPER CUT

Face Gears

provide high-precision when such gears are used as a clutch for airplane engines.

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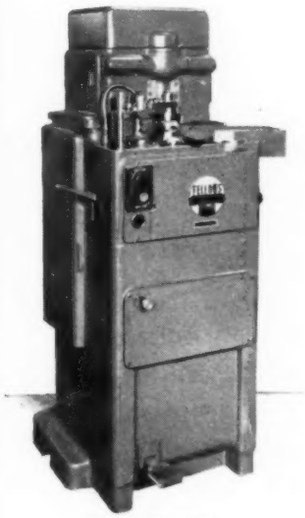
OPPOSED" WORK FIXTURE

GEAR SHAPER # Adaptability

War production needs have spotlighted the *versatility* of the Fellows Gear Shaper. By a simple change-over of cutters and work-holding fixtures, the standard machines have proved a most economical means for turning out a great many high-precision parts—with advantageous economy. Many are non-gear-type parts. Others are gears of special design.

The Face Gear has many advantages. Design-wise it is a most economical, efficient member, not only for many right-angle drives, but also for clutches. The teeth are cut to a high degree of accuracy and on a production basis that meets the most exacting requirements.



Fellows Fine-Pitch Gear Shaper for work up to 3 in. P. D.

In the set-up pictured here, a 180° indexing work fixture permits loading and unloading while cutting is in progress on the opposite blank. A gratifying high production rate is attained. The versatility of the Gear Shaper is that of the machine, *plus cutters* which can be ground in an infinite variety of forms, *plus* work-holding fixtures of equally wide variety.

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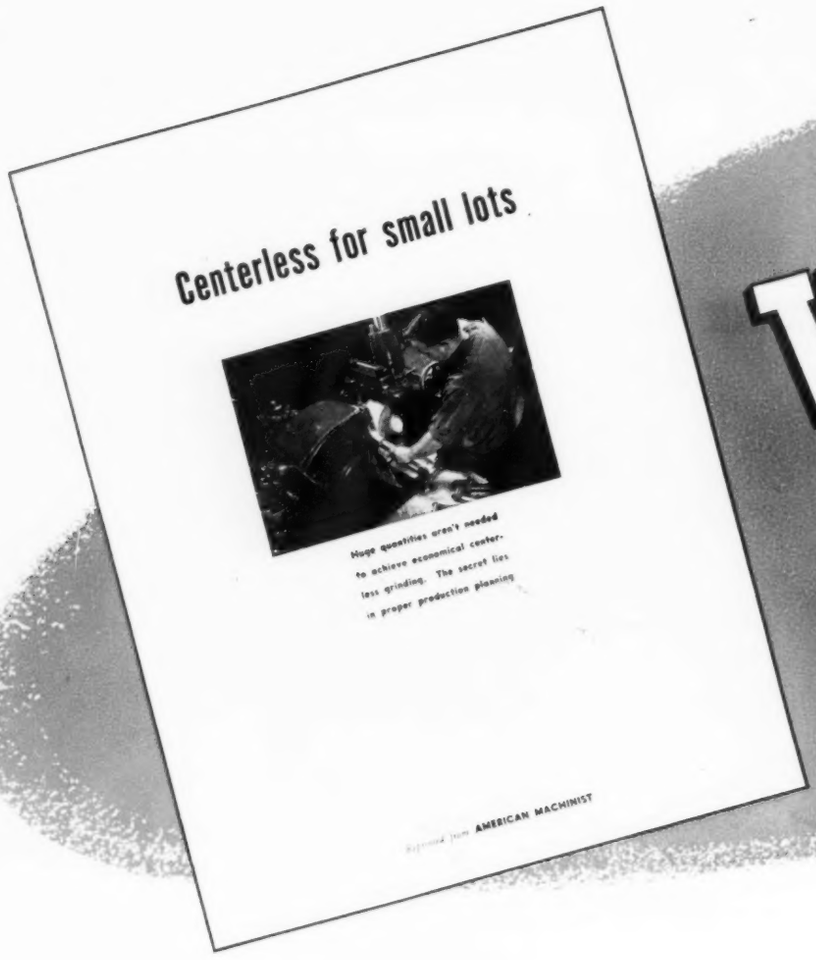
Method

. . . . FROM BLANK TO FINISHED GEAR

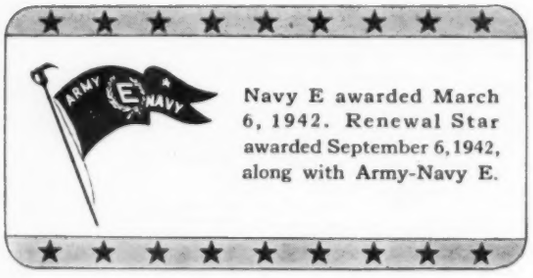

Centerless for small lots
Huge quantities aren't needed to achieve economical center-less grinding. The secret lies in proper production planning
AMERICAN MACHINIST

What do you GRINDING?

These three papers — "Grinding Armature Shafts for Fractional Horsepower Motors" — "Selection and Use of Grinding Wheels for Centerless Thru-feed Grinding" and "Centerless for Small Lots," are official communiques from grinding headquarters. In our files are many such reprints, booklets, papers, reports of studies, and countless case histories. In addition to all this material, we maintain separate folders in which are kept thousands of performance records for individual CINCINNATI Grinding Machines.

This vast library of information is an invaluable storehouse of knowledge. Our experience is available to anyone with a grinding problem. You are invited to enlist our aid at any time.

Send for any or all of the reprints illustrated. They are yours for the asking. Specification catalogs are also available on all types of CINCINNATI Grinding Machines. When writing for catalogs, please mention type of machine in which you are interested. Or, for brief description, look in Sweet's Catalog File for mechanical industries.



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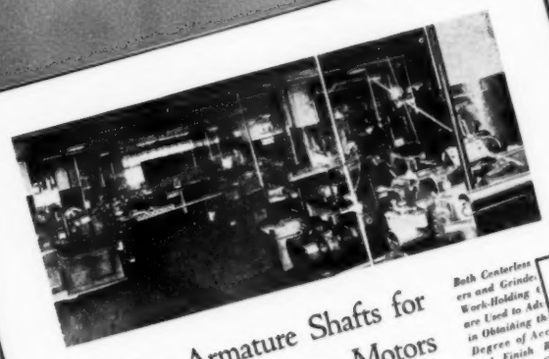
CENTER TYPE GRINDING MACHINES

want to know about

CINCINNATI



Grinding Armature Shafts for Fractional-Horsepower Motors

Both Centerless ers and Grinder- Work-Holding (are Used to Adj in Obtaining th Degree of Acc and Finish Re on Motor Sh

By A. D. MEALS

Cincinnati Grinders Incorporated, Cincinnati, Ohio

THE finishing of armature shafts for fractional-horsepower motors used in washing machines, electric refrigerators, and similar products demands methods that give a high degree of precision, as well as a high production rate. The customers for motors in this field are not satisfied with motors that are merely quiet, but are demanding motors that operate silently. Hence the necessity for a high degree of accuracy and a high finish on the bearings of the armature shaft, which is the heart of the motor. The rotor mounted on the armature shaft must also be finished accurately to the required diameter. It must be straight and concentric with the bearings of the armature shaft to insure a uniform air gap between the rotor and the field of the motor frame.

An ideal installation of grinding machines for these shafts sometimes includes both centerless grinders and center type grinders, and sometimes centerless grinders only, depending upon the motor manufacturer's requirements. Centerless grinders are meeting the requirements in plants demanding high production. In plants where a large variety of sizes and types of armature shafts are ground in small lots, center type grinders alone give the most satisfactory results. Also, on the grinding of larger size armature shafts, the center type grinder is used almost exclusively.

The most efficient method of grinding ar... shafts depends on the number of different di... specified and the size of the shaft, together... the size of the lots ground and the limits of ac... required. As an example, the armature shaft... in Fig. 1 is manufactured on a production b... 100 complete shafts an hour, grinding not o... outside diameter of the rotor mounted on the... concentric with the shaft bearings, but al... shaft itself.

The requirements for the shaft are that th... ous diameters must be absolutely concentri... each other, and the two 1 2-inch bearing dia... must be ground to a high finish and must be ac... within 0.0001 inch, to size within 0.0001 in... round to a zero reading on a liquid gage. Th... quirements are being satisfactorily met with... installation of grinders consisting of the thr... cinnati centerless grinders and the three 6-... inch saddle type grinders shown in the bea... lustration.

The first operation on the shaft shown in... consists of finish-grinding section C and... grinding section D, as shown in the lower... The production data on this and the five succ... operations are given in the accompanying... The in-feed method is used with the faces o... grinding and regulating wheels of the cen...

SELECTION AND USE OF GRINDING WHEELS
FOR CENTERLESS THRUFEED GRINDING

Users of grinding wheels on Centerless machines commonly employ wheels which are harder acting than the best wheels for the work being ground. There are two outstanding reasons given for this:

1. That the hard wheel stands up well under grinding stresses.

2. That the method for using centerless wheels which most operators employ adapts itself only to a wheel which is consistently harder than the ideal wheel for a given job. This method is the conventional one for using centerless wheels. It has been proved, however, that another way is the better. This will be explained below.

The fact that the harder wheel cears better during the grinding operation leads to the incorrect assumption that it is more economical than the correct softer wheel. Reasons why this is usually not true are as follows:

1. Softness and free-cutting are synonymous in most cases because the abrasive particles of a soft wheel break away before they have become too dull. The softer wheel will therefore practically always permit the faster removal of stock. This results in increased production, a fact which should be considered when wheel cost is gauged.

2. The softer the wheel, the greater is its tendency for producing work of high quality. Roundness, straightness, freedom from chatter marks, scoring and burning of the work are much more easily obtainable with soft wheels. The quality of the finish is better as a grind finish. The appearance of the finish obtained with a too hard wheel is superior. Actually this is due to the fact that the hard wheel "glazes" or burns the surface. Dental burrs, ball bearing races, and many other extremely difficult centerless jobs absolutely require wheels which on ordinary work of the same size and material would be considered too soft. Very rapid wheel wear is acceptable in these cases because it is accomplished by trouble-free performance and high quality of work produced.

3. The correct softer-than-usually-used wheel requires less dressing IF THE WHEEL IS CORRECTLY USED. Diamond dressers last longer due to less frequent use and to the fact that the softer the wheel, the less is the wear on the dresser per unit of abrasive removed by dressing. One plant, Detroit Electric Steel Co., Detroit, Pennsylvania, has several grinders which have been running for a number of years without ever having dressed a grinding wheel even for truing up in the case of a new wheel. These machines are used for grinding long bars of various steels and irons. Very fine work is produced. Other machines in the same plant are equipped with diamonds which are used infrequently. Many other machines in other shops are running for days between dressings. Therefore, correctly selected and properly used wheels save on diamonds.

4. Actually the correct wheel will often have a life as long or longer than the usual harder wheel - IF IT IS USED CORRECTLY. While it may be worn more rapidly by grinding, the abrasive lost by dressing by diamond

Expert research technicians maintain a constant effort to put more of the skill into CINCINNATI Grinding Machines and thereby bring more of the variable factors under control.

GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN
Milling Machines

VAN NORMAN

Directional Control of all Power Feeds, Simplifies Operation

OF VAN NORMAN MILLERS

Table control levers. Push towards right side of miller to move table to the right, towards left side of miller to move table to left.

Saddle control levers. Move towards front of machine to move saddle forward, push towards rear of machine to move saddle back.

Knee control levers. Lift to raise knee, push down to lower knee.

It is easy for the apprentice to learn and the skilled operator to remember that the table, knee and saddle of any Van Norman Miller travels in the same direction that the control levers are moved.

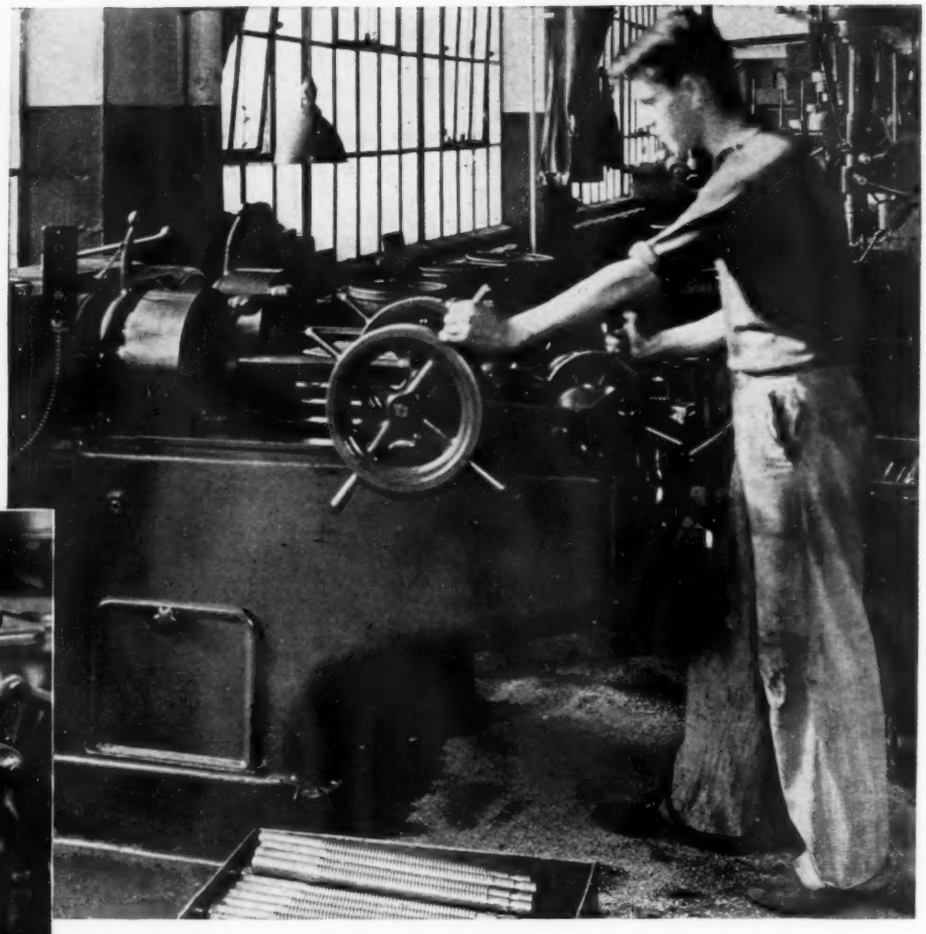
For example, if the operator is standing in front or rear of the machine and wishes to move the table to the right, he moves the table control lever to the *right*, if he wants to raise the knee, he *lifts* the control lever for the knee, if he wants to lower the knee, he pushes this same lever *down*.

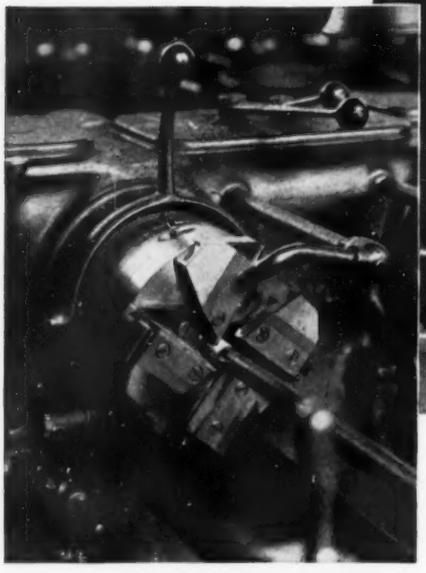
From *either front or rear*, the operator has complete directional control of *all* power feeds,—simple, practical and time-saving. Add to this feature, the front and rear control of feed selection by a single lever, as well as front and rear control of 6-way power rapid traverse and you will see why operators prefer Van Norman Millers.

★ *In June, 1942, Van Norman was awarded the Army and Navy Star in recognition of its war production record.*

MACHINE TOOL CO., SPRINGFIELD, MASS.

LANDMACO *Speeds Thread Production For Our* SHIPS of WAR





LANDMACO precision threads of uniform quality assure faster and more uniform assemblies and therefore speed up production of our ships of war. In the building of submarines, warships and transports, LANDMACO Threading Machines are playing a vital part and setting outstanding production and performance records. Our forty years of research and experience in manufacturing threading equipment has developed the modern Landis Line—the ultimate in precision threading equipment.

LANDIS MACHINE COMPANY
WAYNESBORO, PENNA., U. S. A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

LANDIS THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

CHASER BREAKAGE IS COSTLY AND SLOWS PRODUCTION

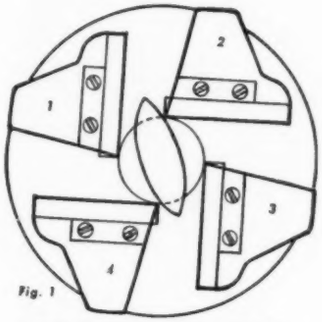


Fig. 1

NOTE: WITH BADLY SHEARED STOCK TWO CHASERS CARRY ALL THE THRUST OF INITIAL CUT

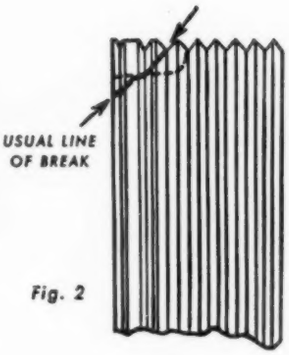


Fig. 2

THE CORRECT TOOL FOR THE JOB, AND THE JOB PROPERLY PREPARED FOR THE TOOL, REDUCES COST AND INCREASES PRODUCTION

FORCING BADLY SHEARED STOCK INTO CHASERS IS COSTLY

Stock which is sheared with worn tools has an elongated end that throws all the first cutting thrust on two chasers.

High Speed Steel, from which chasers are made, will not withstand such shock, with the result that the chasers break at the lip rake angle. One or more chasers in a set may be completely ruined, or, at least, it may be necessary to grind away a quarter or even a half inch of the chaser to renew the cutting edge.

Don't force badly sheared stock into your die heads.

COOLING CHASERS IN WATER INCREASES CHASER BREAKAGE

When High Speed Steel is cooled suddenly in water, it shatters almost like glass. If chasers are overheated in grinding, permit them to cool slowly. If dipped in water, minute cracks will appear, which will result in chaser breakage when the tools are placed into operation.

INCORRECT GRIND FOR CAST BRASS MAY NOT ONLY RUIN THE ENTIRE SET OF CHASERS, BUT ALSO THE CHASER CLAMPS

Cast brass should be threaded only with chasers having a negative rake angle—(5 Deg. negative is usually recommended). Rather than regrind a set of chasers, many users attempt to use chasers which are ground for drawn brass or steel, having a 10 Deg. to 25 Deg. positive rake angle.

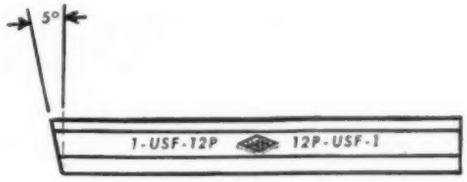


Fig. 3

Chasers having a positive rake angle, when used on cast brass, will tend to dig into the work, crushing it out of round to the extent that the chasers being under cut are not only broken by this unusual strain which is set up, but also the chasers may be pulled out of the holders, thus damaging the chaser clamps.

Use a negative rake angle for threading cast brass. If a slight chatter appears in the thread, advance the chasers slightly from their regular gauge setting position.

Be Thread-Wise—Employ LANDIS Long Life Tangential Chasers

LANDIS MACHINE COMPANY
Waynesboro, Penna., U. S. A.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws—End Mills—Taps—Dies—Screw Plates —Profile Cutters—

THE TOOLS YOU BUY AGAIN

Try them on the basis of ASSURED *better performance . . .*

Shop after shop has come to recognize the ruggedness, accuracy and fast cutting action of UNION TOOLS after proving them out on difficult jobs.

There is sound reason for the better performance of these cost cutting tools. One of these reasons is the *experience behind them*—an experience that involves years of research, as well as outstanding technical, metallurgical and manufacturing facilities second to none in the field of small tool production.

Because Union has the means for producing tools of the finest quality and concentrates every resource on achieving highest performance standards on all tools bearing the name "UNION", users of UNION tools can always be certain of efficient, economical service.

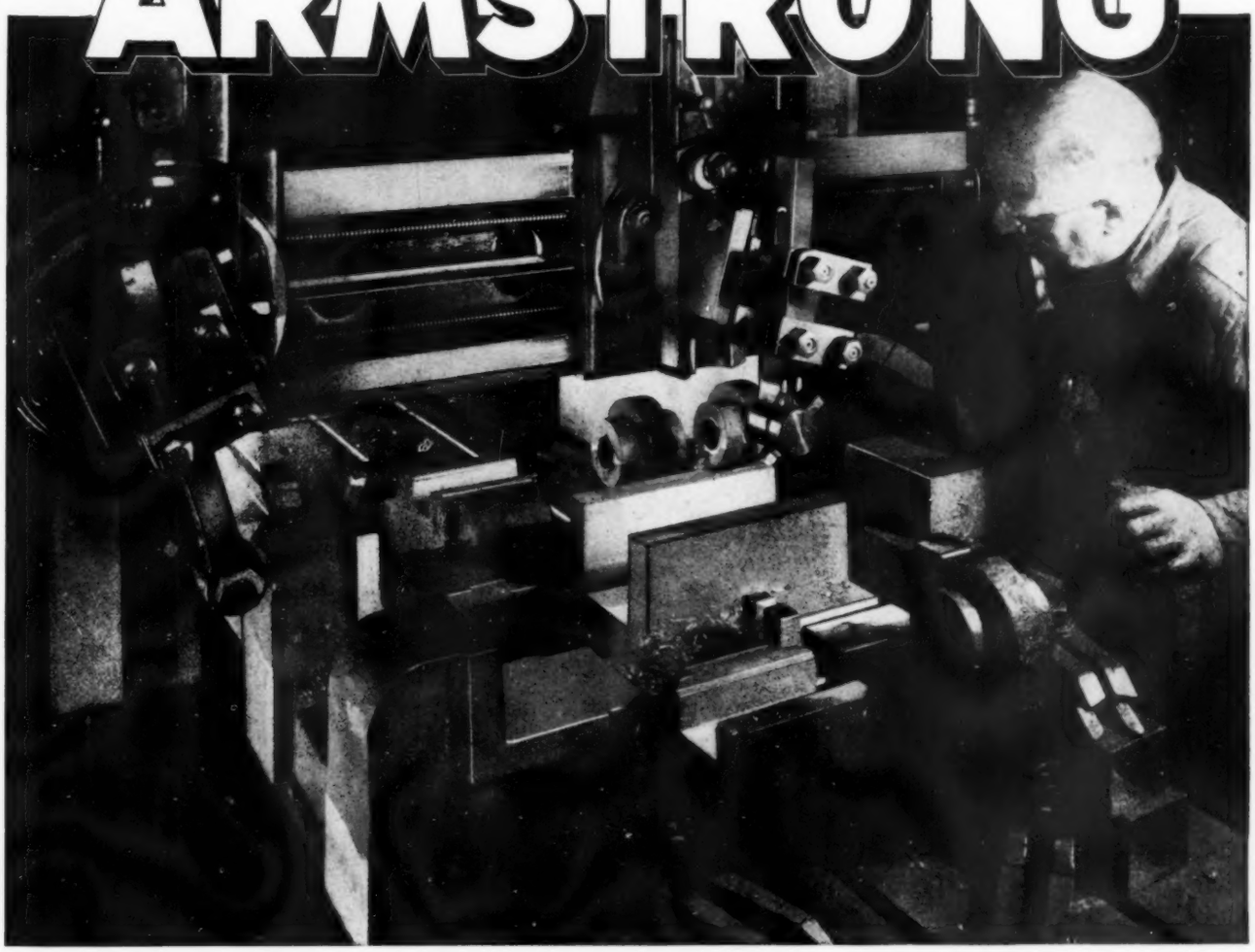
UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec
Representatives throughout the world

UNION

ARMSTRONG



There's an extra shift's production in most ARMSTRONG TOOL HOLDERS

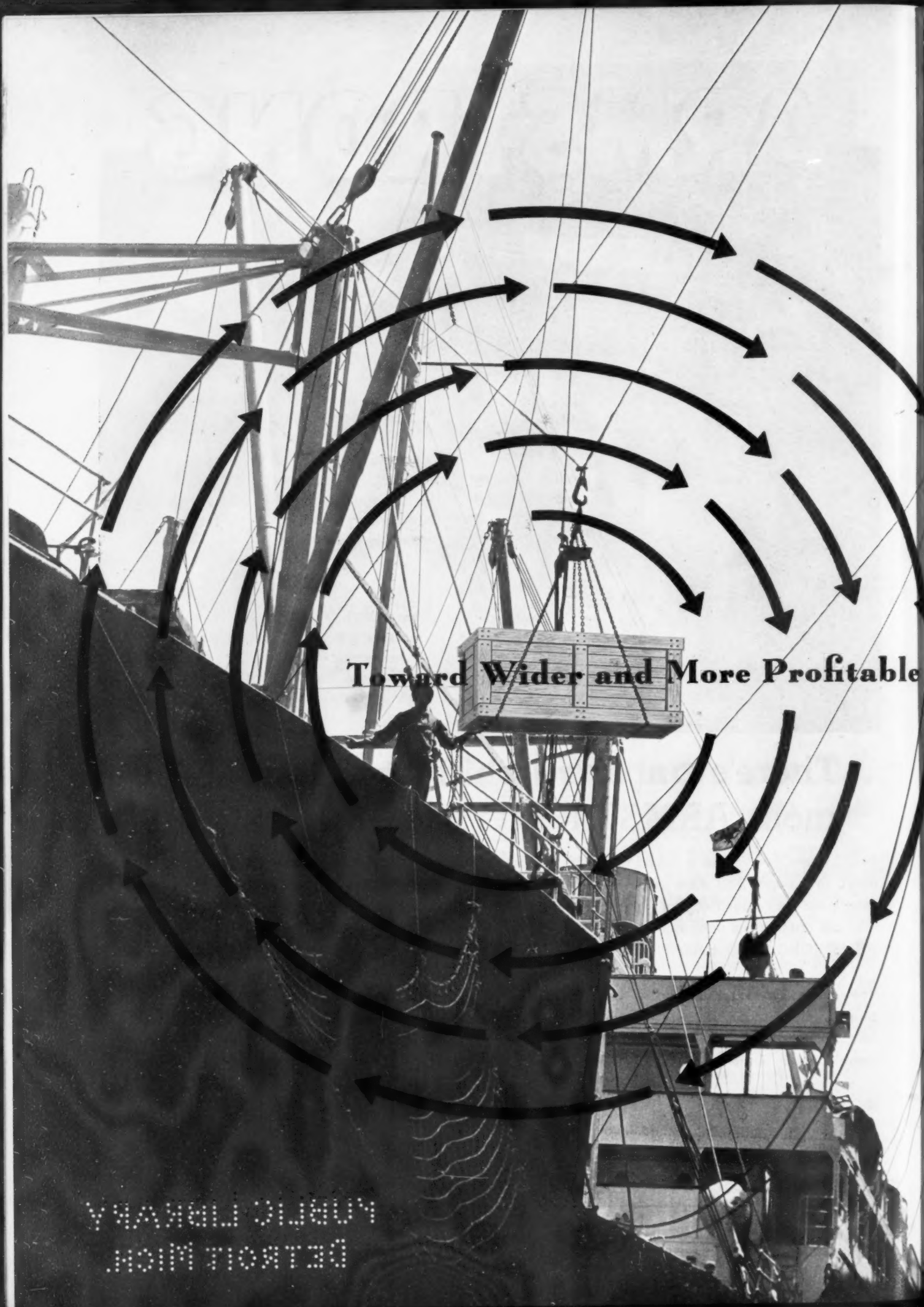
Today when every man is asked to give that extra effort, to produce still more and we are asked to search out any added capacity that can be pulled into this fight, let us point out the extra capacity in ARMSTRONG TOOL HOLDERS.

The cutting speeds customarily used on lathes, planers, slotters and shapers are generally based on "inherited" standards, many of which were established in forged tool days. These are in no way true measures of the capacities of modern ARMSTRONG TOOL HOLDERS. With the correct ARMSTRONG TOOL HOLDER for each operation, speeds and feeds can be greatly increased (sometimes doubled) with safety and without loss of cutting efficiency. There usually are a full range of smooth cutting speeds above the first "chatter" point and extra capacity in finished pieces per machine hour which you can add to your war production without additional equipment.

Write for Catalog C-39

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave. **Chicago, U. S. A.**
Eastern Warehouse & Sales: 199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



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ble

Future Markets

SOMETHING important is happening today . . . right in your own plant!

It is not very clearly apparent, in the day-to-day confusion of meeting war production schedules — yet you have seen it happening in countless small ways:

A new technique for a difficult operation . . . a new and cheaper substitute for a scarce material . . . a new substance, a new alloy, a new source of more abundant supply . . . new speeds and efficiencies in production and performance.

Little things.

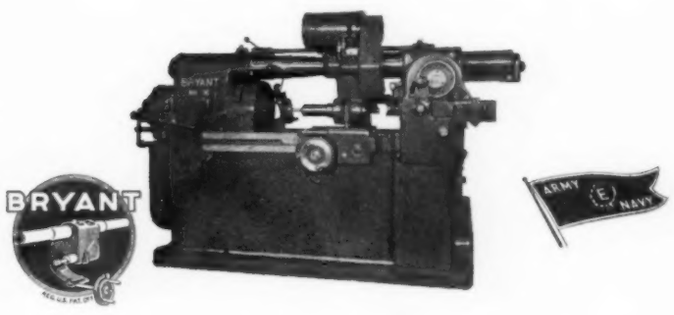
Yet it is just these "little things" resulting from the grim necessities of war that are adding up to something big for post-war America:

As many as ten magnesium producers, for instance, where only one existed before . . . synthetic rubber and a score of other cheaper and better substitutes, freeing us from foreign dependence . . . undreamed of advancement in aviation, air transportation, communications, housing, and the use of the new light metals.

Big things!

The most important essential to your prosperity in the wider and more profitable markets after this war is *planning* . . . planning as early as possible the products you will manufacture — planning in advance for conversion to post-war production . . . and in this, Bryant engineers can actually help you *now*.

Write today. Give them the facts concerning your present and post-war program, and let them make a thorough study of ways in which you can speed production, cut costs, and prepare to convert your plant to profitable peace-time production the day this war is over!



BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Send for the Man from Bryant

An *EXTRA* Man and his Machine

. . . free to speed the production flow!

KEARNEY & TRECKER
CORPORATION

A large Eastern Can Company found that by using a vertical milling attachment on a plain type horizontal machine — one operator could perform two milling operations and save considerable time by so doing.

Ordinarily the piece would have been shifted to another machine, thereby introducing a strange operator to the job — causing a serious loss of time while he studied

Milwaukee **M A C H I N E**

the prints, already familiar to the original operator. This, in a sense, released the second man and his machine, permitting him to do other work vital to the war effort.

If you have a similar problem — perhaps one of our standard Milling Attachments will enable you to do the job faster, easier, in less time.

We'll finish it !

That sounds like you'll get ACTION — and you will! Yes sir, if you have a milling problem that needs attention NOW — wire us the details and we'll go into action at once. If our literature will do the job or one of our standard Milling Attachments — fine! If the solution calls for one of our Emergency Production Service Men to come *on the double* — we'll have him on the way in the shortest possible time. That's what our nation-wide network of Sales-Service men is for — to help you help our Country do the kind of job it is going to take to WIN in the shortest possible time.

★

Feel free to wire *today* to

EMERGENCY PRODUCTION SERVICE DEPARTMENT

KEARNEY & TRECKER CORPORATION

Milwaukee, Wisconsin

★

T O O L S

Today.

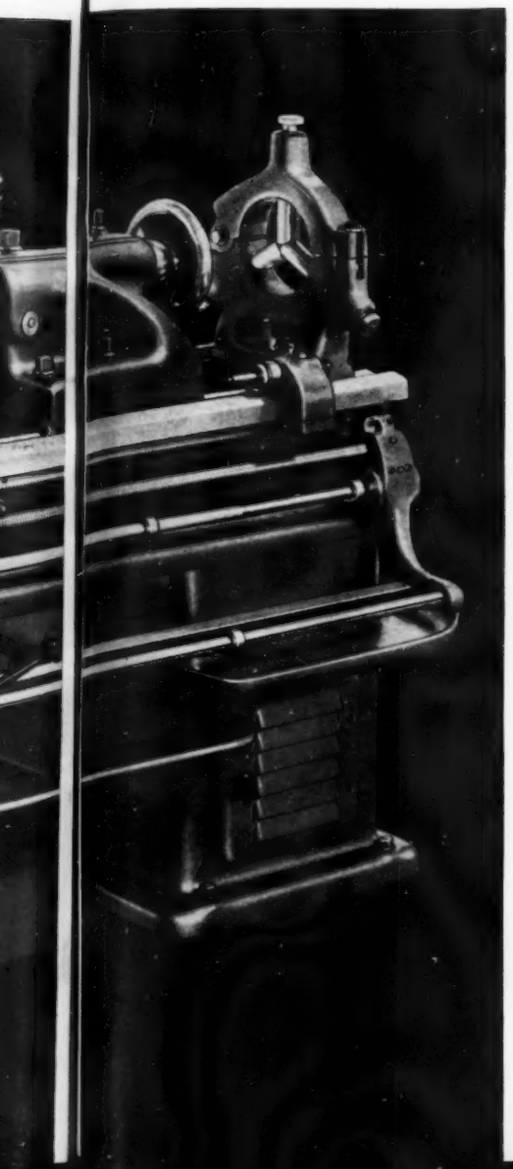
American Pacemaker

THE AMERICAN

LATHES

....TIME SAVING

is a MAJOR OBJECTIVE



Speed changes are accurately and instantly made on "American" Pacemaker Lathes.

Just two levers provide 27-spindle speeds. Operator does not have to remember speed charts or lever positions—the speed plate is direct reading and right in front of him.

This new operative convenience, plus lots of power and fine lubrication are helping to speed up production—maintain accuracy and increase effective life of "American" Pacemaker Lathes.

Bulletin No. 15 is liberally illustrated to show the Pacemaker's many functional advantages.

N TOOL WORKS CO., Cincinnati, U.S.A.

S • RADIALS • SHAPERS

Building

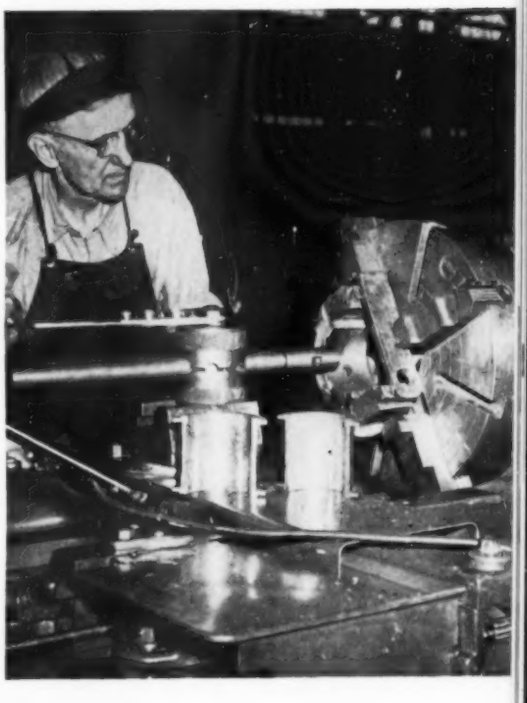
g ships faster for the A·E·F·

Two great war industries — one launching ships with almost incredible speed, and the other breaking new records in the delivery of propulsion machinery — count their Monarch lathes as highly essential units of their plant equipment.

The photograph at the right, taken in the shipyard, pictures an "old-timer" boring a half-bearing on an 18" Monarch. This is just one of the thousand and one lathe jobs being done in this yard on Monarchs.

•

The young man at the left, who helps to build propulsion machinery, is turning an adapter plate for a balancing machine used for testing parts of the huge turbines that drive our transports and cargo ships. As will be noted from the sign, this Monarch did the first cutting in the $26,000,000 plant, and here Monarchs are widely used for tooling as well as for production.



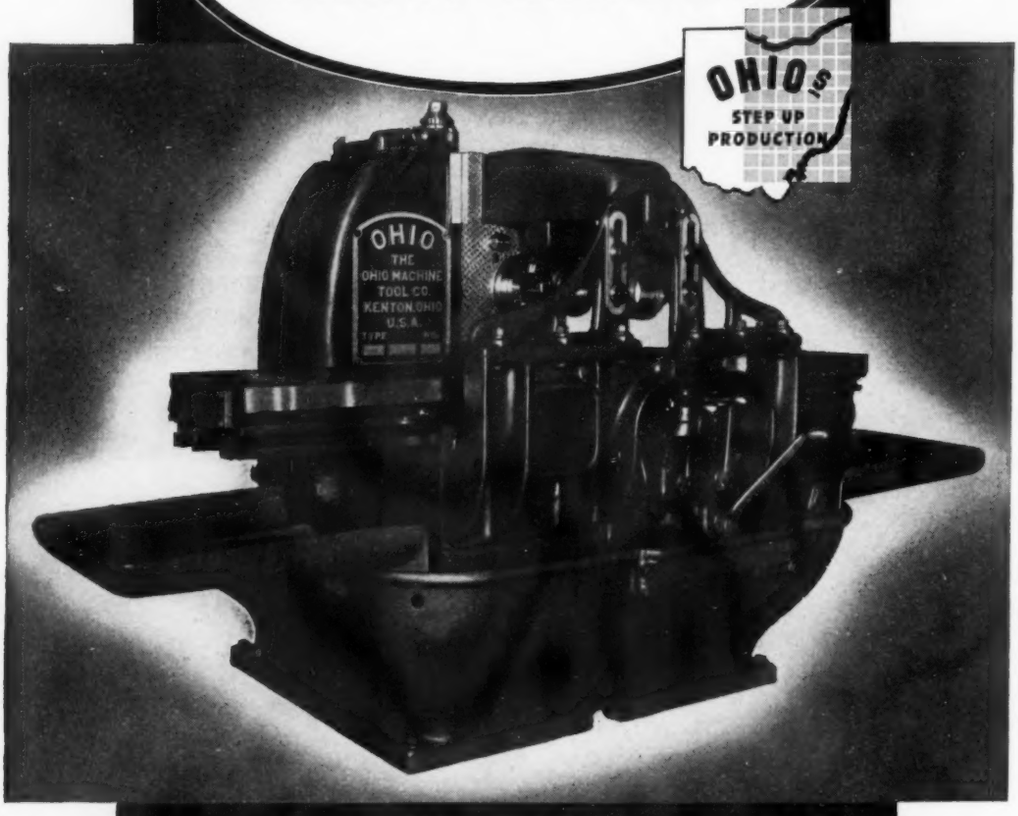
Whether it be maintenance work, an emergency job or a mass production project, the accurate and fast performance of Monarch lathes is helping these two plants and others to reach new records in shipbuilding.

THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES

COVER THE TURNING FIELD

OHIO PRODUCTION MILLING MACHINES



Convenience and accessibility make the *Ohio Production Milling Machine* rapid in production, yet easy to set up for short runs. Powerful, true cutter rotation, rigidity, a true plane of travel and positive locked feed enable it to mill equally well *with and against the feed*, making possible continuous milling operations without indexing features. Climb-cutting lengthens cutter life. Various cycles of automatic operation of the feed and rapid traverse are available.

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO

Orders for Ohio Production Milling Machines are being shipped promptly.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES · SHAPERS · PLANERS

"MY MAN FRIDAY
. . . Every Day in the Week"

More pieces faster, in less time with less space and waste.

Wide ranges of feed and speed.

Heavy, rigid slide supports for heavier forming cuts.

Cams on one camshaft above working area — free from falling chips, oil and grit.

Tooling area, cams and controls convenient to operator from either side of the machine.

It pays to specify Cones; wire, phone or write for particulars.

4, 6 and 8 Spindle Automatic Bar Machines

CONE AUTOMATIC MACHINE CO., INC.
WINDSOR, VERMONT, U. S. A.

They're EX-CELL-O *Machines*

. . . KEEP THEM GOING

UNINTERRUPTED production is industry's most urgent job today—'round all the hours on the clock every machine that can "take it" must be kept going if the vast volume of work that war demands is to be produced without delay. . . . Wherever Ex-Cell-O precision machine tools are in use, there's no problem as to continuous service. They're designed and built to "take it", *every* hour of the day, *every* day of the week. The Ex-Cell-O name on a machine tool means not only a *precision-built* machine to do *precision*

EX-CELL-O CORPORATION

Over each of the four plants of Ex-Cell-O in Detroit fly three flags . . . the Stars and Stripes, as always, the Army-Navy "E" pennant, and the *first* United States Treasury "Bull's-Eye" War Bond flag.

Precision THREAD GRINDING, BORING AND
POWER UNITS • GRINDING SPINDLES • BROACHES
INGS • DIESEL FUEL INJECTION EQUIPMENT •

NG ALL THREE SHIFTS . . .

ent job work, but a machine that gives the utmost in efficiency
every with a minimum in maintenance attention. . . . To get
g if the the best use out of any Ex-Cell-O equipment you have
to be in your plant, you should have available the practical
-Cell-O information in the Ex-Cell-O Instruction Book apply-
roblem ing to the particular Ex-Cell-O machine you have. If
d built you do not have this now, just write to Ex-Cell-O in
of the Detroit, stating the type and the style of the Ex-Cell-O
means machine tool you're using, and a copy will be mailed
ecision immediately . . . without any cost to you, of course.

ON DETROIT, MICHIGAN

AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC
CHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSH-
NT • R. R. PINS AND BUSHINGS • PRECISION PARTS

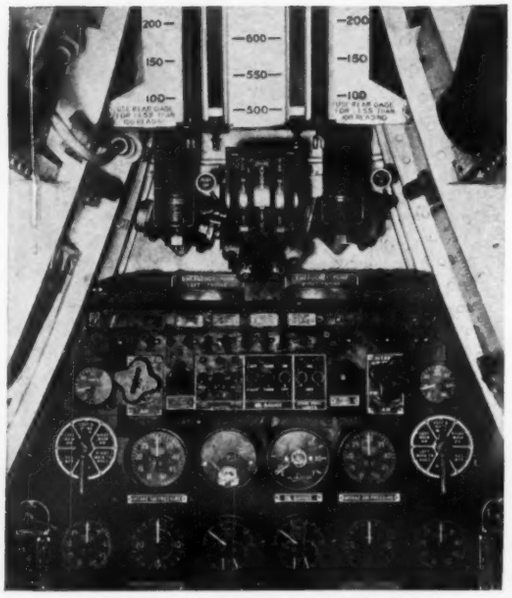
XLO

EX-CELL-O *means* PRECISION

A Suggestion For Solving a War Production Problem

BARBER-COLMAN

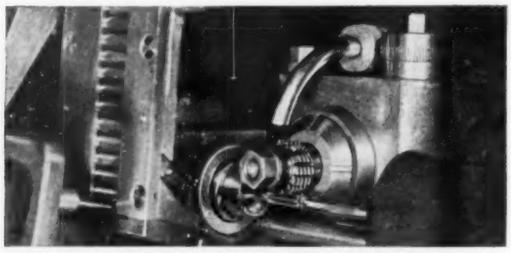
TYPE "S" HOBBING MACHINES FOR SMALL GEARS IN INSTRUMENTS



("OFFICIAL U. S. NAVY PHOTOGRAPH")

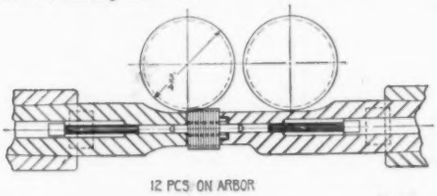
INSTRUMENT BOARD OF NAVY PLANE

These engine-performance instruments, watched by the mechanic in the tower of a patrol plane, are typical of thousands of indicating units which require small gears and pinions of high accuracy in great numbers.

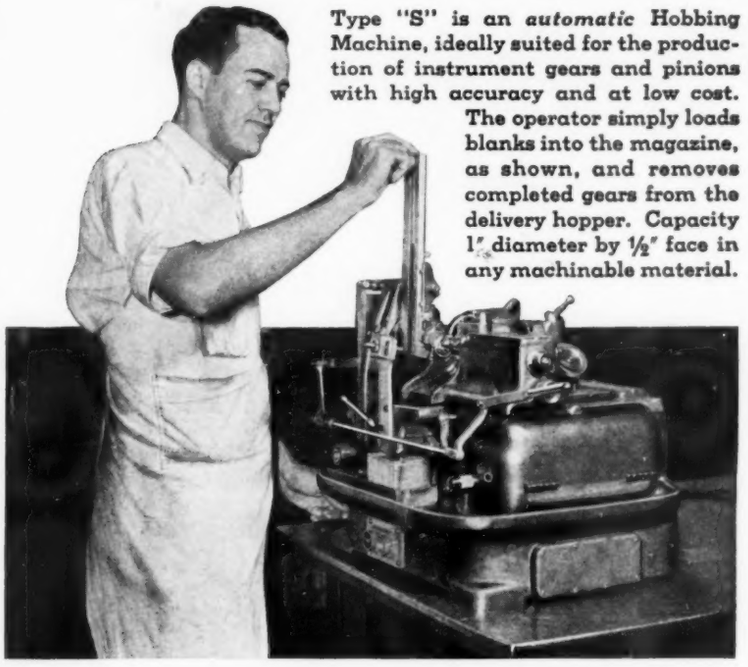


CLOSE-UP OF TYPE "S" OPERATION . .

Showing a 7-tooth, clock form, .0768" circular pitch pinion in process of being hobbed. Note the cut-away tail stock permitting clearance for the hob teeth on a gear of small diameter, also the swinging magazine withdrawn during the cut.



12 PCS. ON ARBOR



Type "S" is an *automatic* Hobbing Machine, ideally suited for the production of instrument gears and pinions with high accuracy and at low cost. The operator simply loads blanks into the magazine, as shown, and removes completed gears from the delivery hopper. Capacity 1" diameter by ½" face in any machinable material.

ACCURACY. Close tolerances are maintained on both tooth form and spacing, as a natural result of the hobbing process which is a continuous generating action.

Special precision tooling equipment is supplied to suit customers requirements. Users have reported run-out of less than .0002".

PRODUCTION. Actual rate of production depends, of course, on characteristics of the work such as accuracy and finish desired, size, number of teeth, etc. One job is being cut at the rate of 640 pieces per hour.

MECHANICAL CONTROL. All machine functions are automatic and under positive mechanical control. This includes moving the work to cutting position, rapid approach to hob, feed, quick return, ejection of work, and repeat.

A TYPICAL TYPE "S" SET-UP . . . .

The drawing at the left shows how a load of 12 small, thin gears, pre-loaded on a special arbor, are held between the driving head stock and retractable tail stock. Circles indicate the start and finish position of the ¾" diameter hob.

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

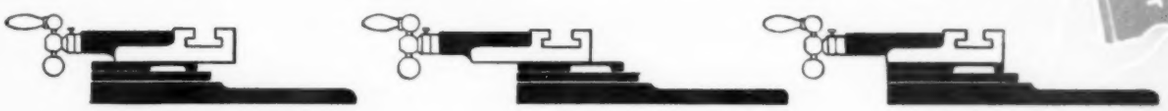
I'm Tellin' You...

No. 4 in a series of tips on "Keeping 'em Turning"

by ***George Whitehouse****, 41 years at LeBlond's*

Lots of new lathe hands figure that rough turning is a kind of hacking process that doesn't call for much brain work. It's probably true that roughing isn't as much of a trick as finishing, but there are some important do's and don'ts. Here's some dope that you will want to remember.

1 POSITION OF COMPOUND REST FOR ROUGH CUTTING



This is wrong. Slide overhangs too far to right. Might break in middle of tee slot.

This is wrong, too. Slide overhangs to left. Also could break in middle of tee slot.

This is right. When making heavy cuts, top slide should be flush with bottom slide so all metal is in compression.

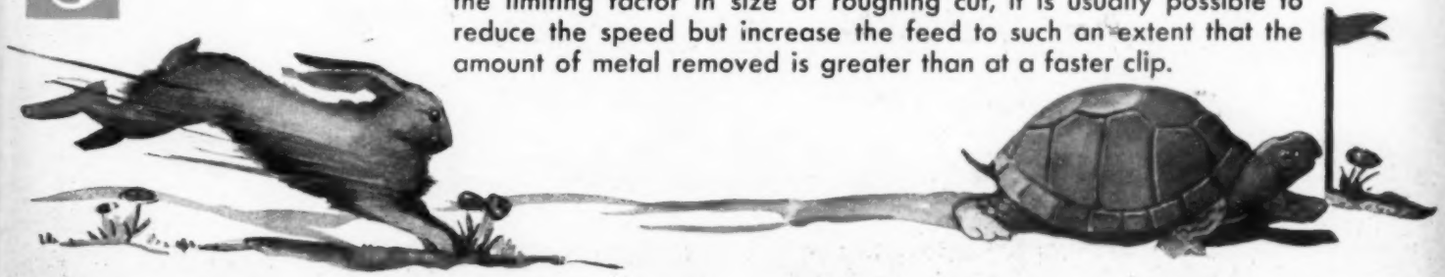
2 CUTTING SPEEDS

KIND OF MATERIAL	CUTTING SPEED Ft. per Min.	DEPTH OF CUT Inch.	RATE OF FEED Per Rev.
CAST IRON	210	3/8	0.062
SEMI-STEEL	280	1/8	0.012
TOOL STEEL	140	1/2	0.020
BRONZE	425	3/16	0.024
BRASS	458	3/32	0.108
ALUMINUM ALLOY	570	1/8	0.031

When using carbide type tools, these figures are as good as any for a general guide. The rigidity of the machine and tool support, interrupted cuts, etc., will make experimentation and adjustments desirable.

3 SLOW DOWN AND FINISH SOONER . . . .

There is a tendency for many lathe operators to work their machine far below top efficiency because they fail to take a deep enough bite. Where tool failure is the limiting factor in size of roughing cut, it is usually possible to reduce the speed but increase the feed to such an extent that the amount of metal removed is greater than at a faster clip.



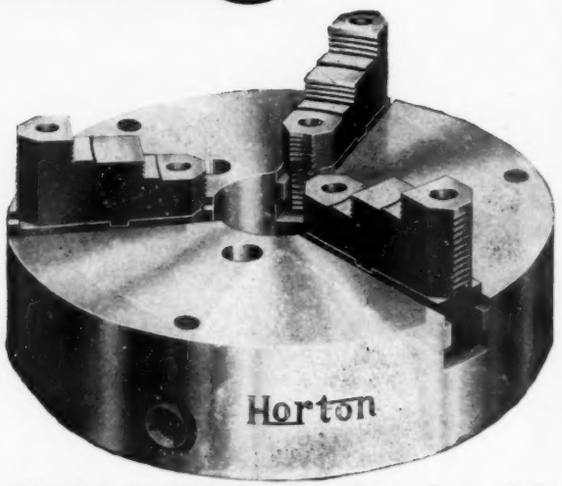
THE R. K. LeBLOND MACHINE TOOL COMPANY

CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

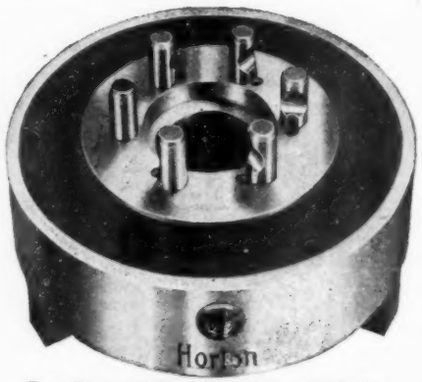


SCROLL UNIVERSAL Two-Piece Jaws Only

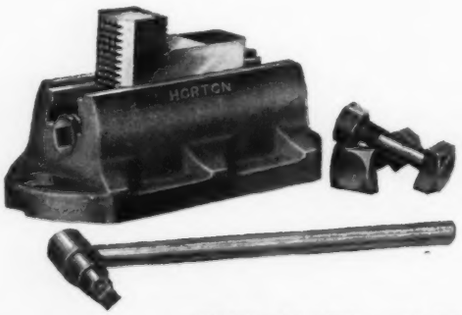
For Use With Intermediate Plates On Threaded Spindles

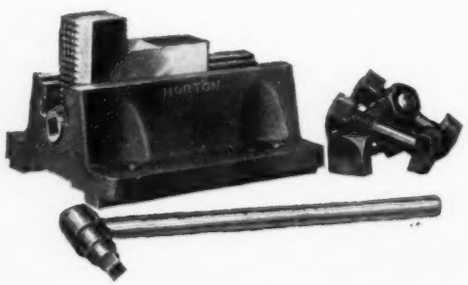
For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle

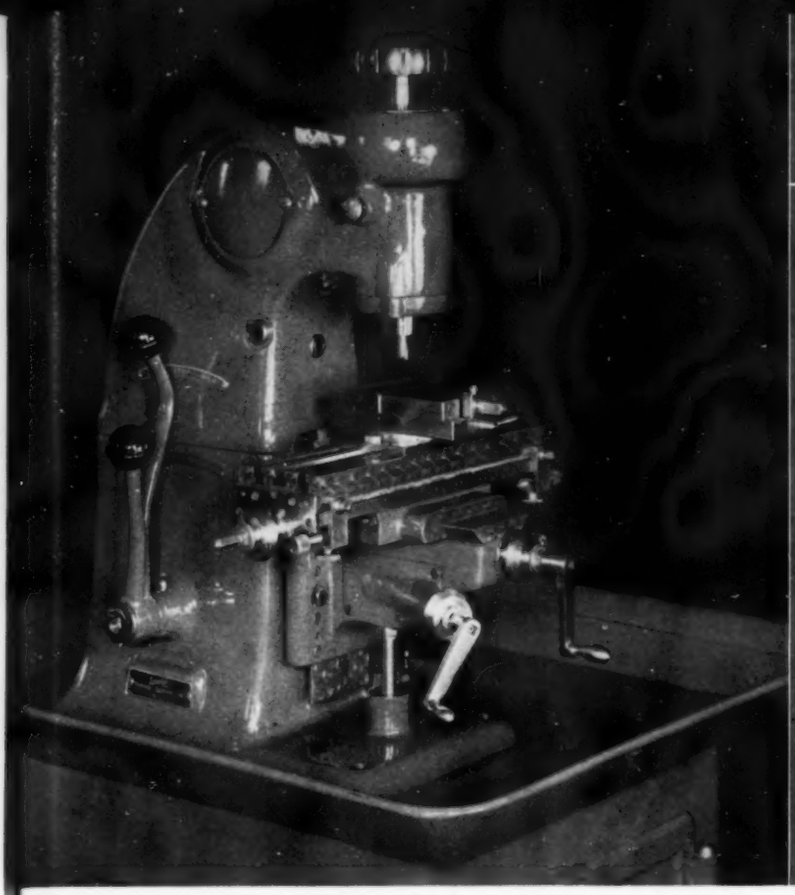




HORTON
MORROW

FACE PLATE and BORING MILL JAWS—Steel Body Only

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.



HARDINGE
ELMIRA, N.Y.

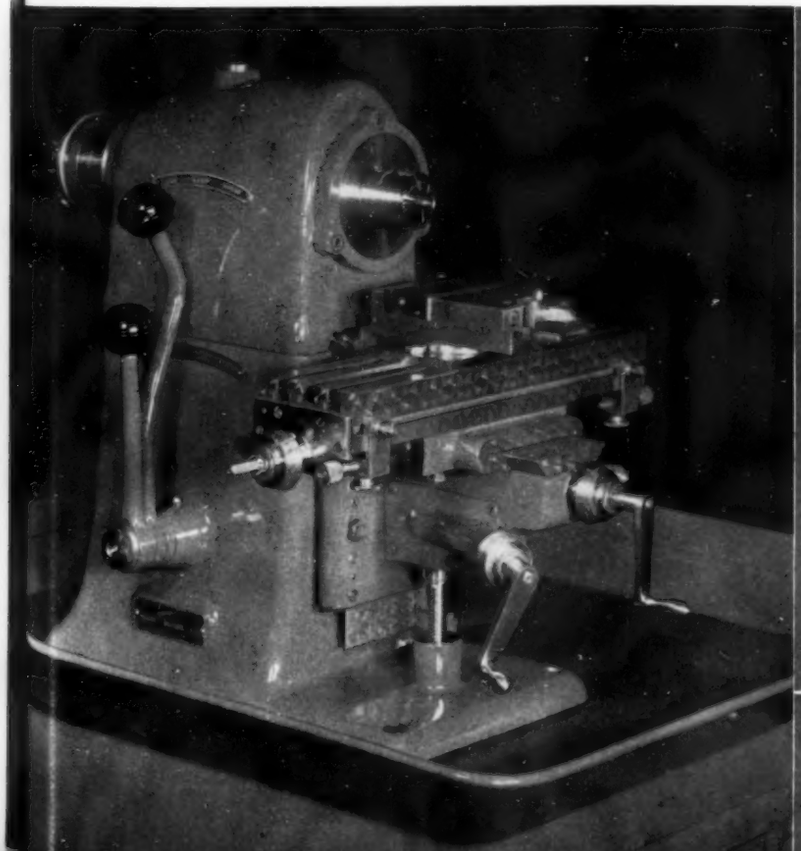
HARDINGE BB2V PRECISION MILLING MACHINE

Table: 12" x 3-3/16"
Eight Speeds: 300 to 5000 R.P.M.
Vertical Head has 1/2" Collet Capacity

HARDINGE
HIGH SPEED PRECISION MILLING MACHINES

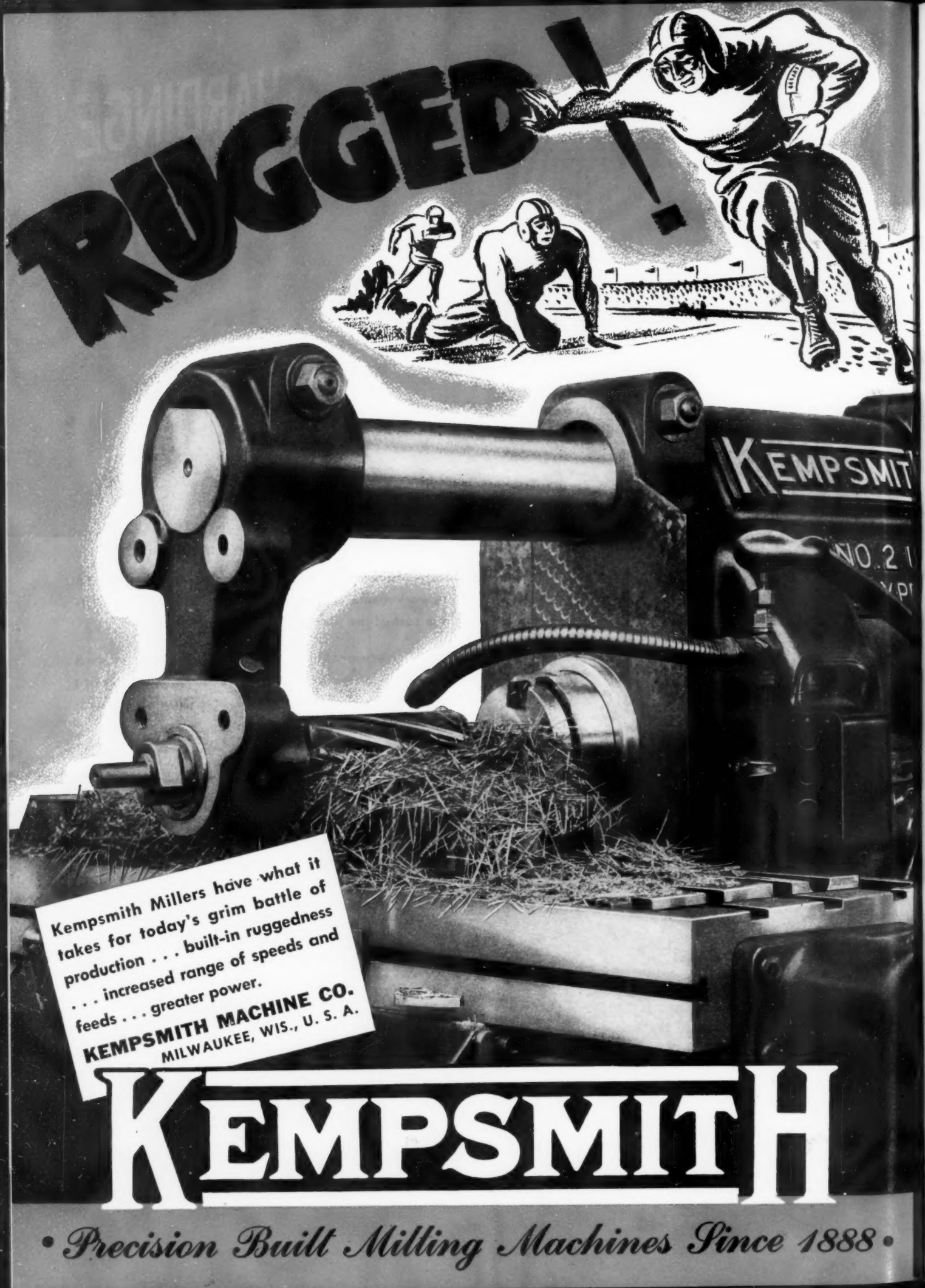
CORRECT SIZE: Closer proportion in the size of a machine tool to the size of the work means greater economy in the original investment and in the cost of the parts produced.

These HARDINGE Precision Milling Machines are small, compact machines designed to do a volume job on small parts, thus releasing large equipment that is too cumbersome for small work in production, tool-room or development departments.



HARDINGE BB4 PRECISION MILLING MACHINE

Table: 12" x 3-3/16"
Eight Spindle Speeds: 180 to 3000 R.P.M.
Cutter and Index Heads have 3/4" Collet Capacity



Kempsmith Millers have what it takes for today's grim battle of production . . . built-in ruggedness . . . increased range of speeds and feeds . . . greater power.

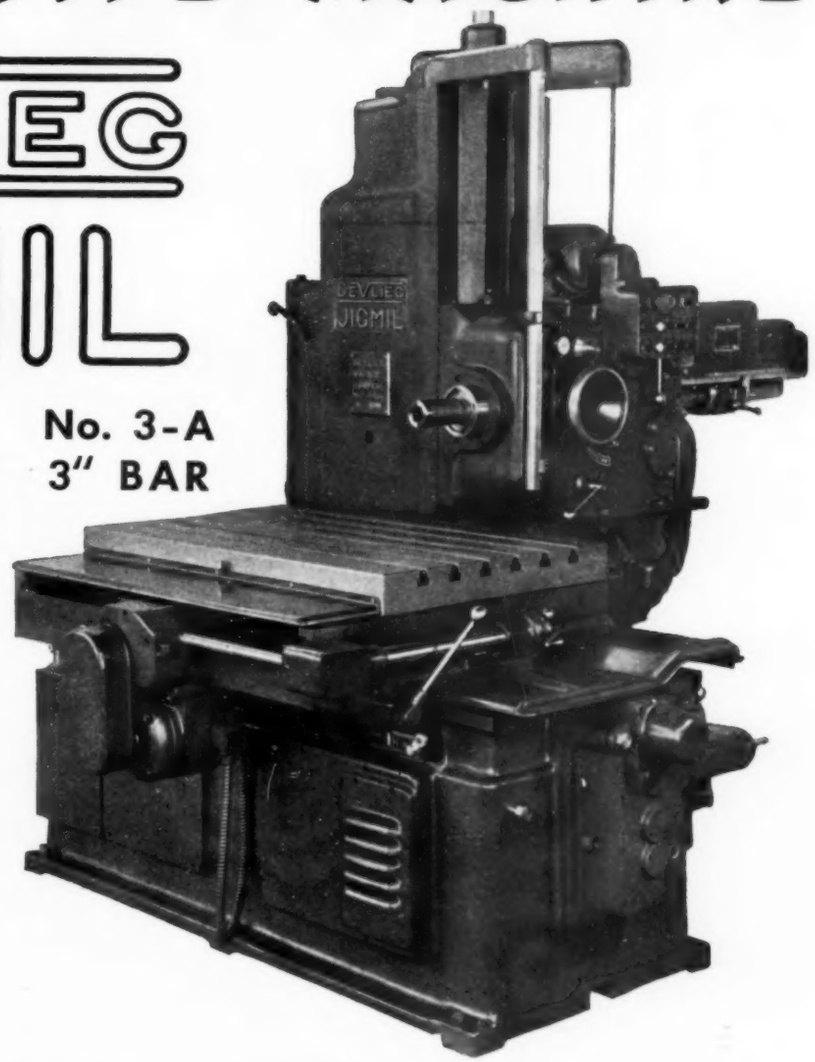
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

A NEW TYPE MACHINE

DEVLIEG JIGMIL



No. 3-A
3" BAR

To more accurately and speedily serve the broad field needing a machine having

• • •

THE SPACING ACCURACY OF A JIG BORER

• • •

THE PERFORMANCE QUALITIES OF A MILLING MACHINE

• • •

THE CONVENIENCE AND FLEXIBILITY OF A HORIZONTAL BORING MILL

☆ A PRECISION MACHINE ☆

Featuring

NEW SPEED OF OPERATION

NEW ADVANCED FINGER TIP CONTROLS

NEW STANDARDS OF EXCELLENCE OF BORED HOLES

NEW ACCURACY IN MILLING

AUTOMATIC TABLE RETRACTION AND REPOSITIONING

Many machines in operation show 75% greater average daily productivity and improved dependability for precision.

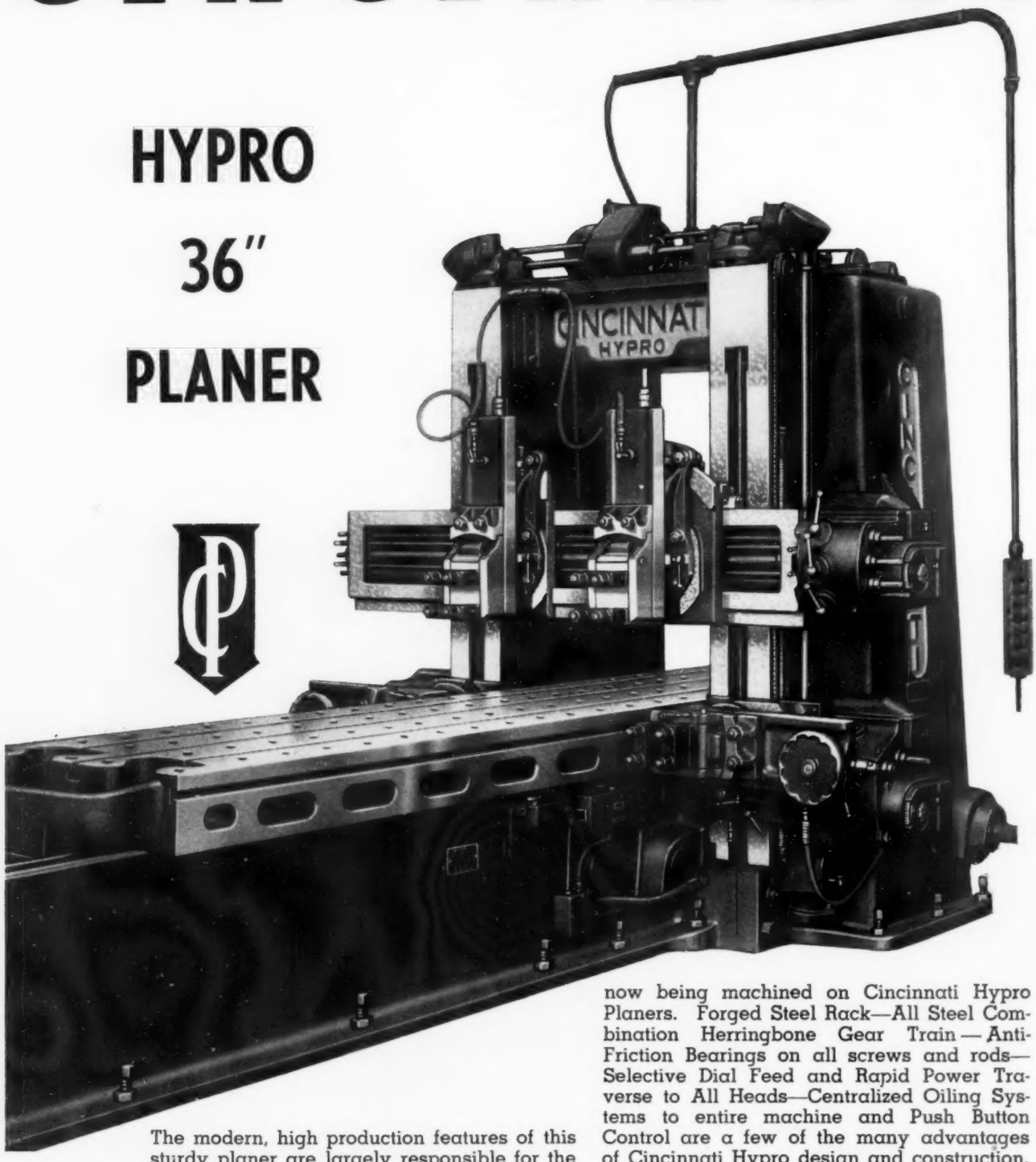
Write for Circular

DEVLIEG MACHINE COMPANY
450 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

DEVLIEG MACHINE TOOLS

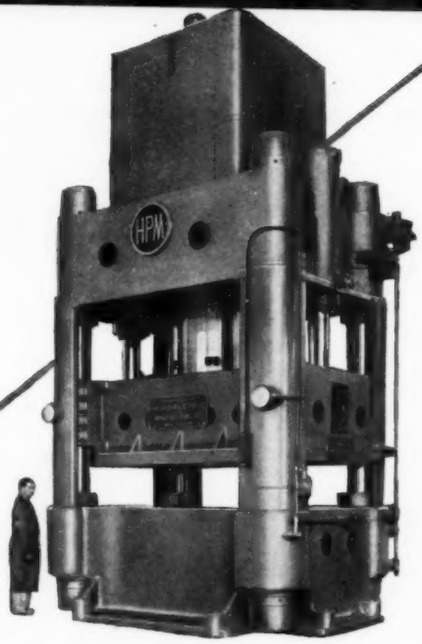
CINCINNATI

HYPRO 36" PLANER



The modern, high production features of this sturdy planer are largely responsible for the increased output—adherence to close tolerances—and lower costs on war equipment now being machined on Cincinnati Hypro Planers. Forged Steel Rack—All Steel Combination Herringbone Gear Train — Anti-Friction Bearings on all screws and rods—Selective Dial Feed and Rapid Power Traverse to All Heads—Centralized Oiling Systems to entire machine and Push Button Control are a few of the many advantages of Cincinnati Hypro design and construction. Bulletin No. 135 contains complete information. Write for a copy.

THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI . OHIO . U.S.A.



AUTO BODIES TO AIRCRAFT

with HPM

The Murray Corporation of America converted to Aircraft production with the aid of this modern 2500-ton H-P-M FASTRAVERSE Press. It employs the Guerin rubber pad process of blanking and forming many dural parts at each operation. Loading tables, working in from all four sides, speed production . . . The exclusive H-P-M HYDRO-POWER Radial Pump and "Closed Circuit" operating system insure dependable performance every hour, day and night. » » »

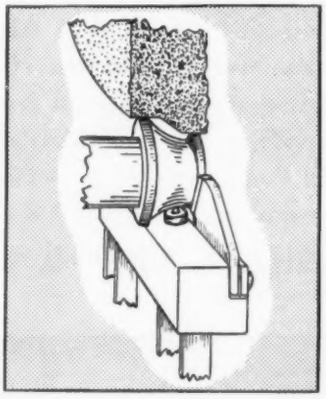
THE HYDRAULIC PRESS MFG. COMPANY, MOUNT GILEAD, OHIO, U. S. A.

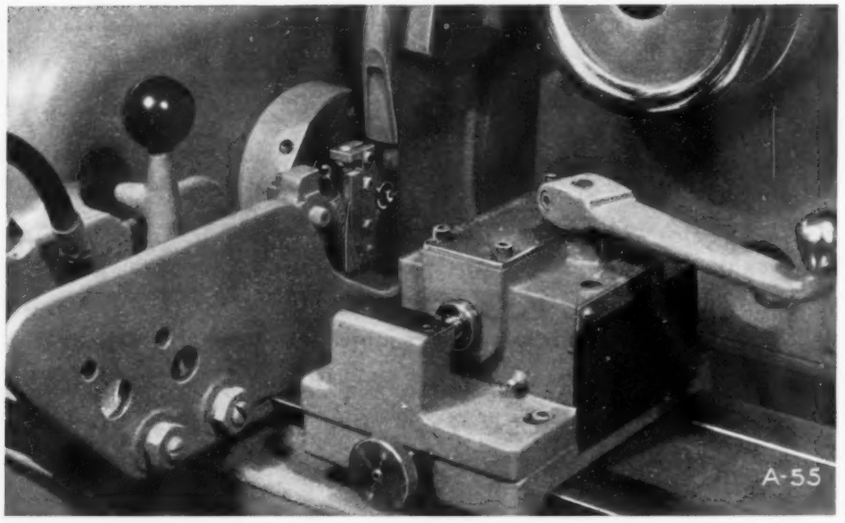
District Sales Offices: New York, Syracuse, Detroit and Chicago.. Representatives in Principal Cities

Industry relies on **H·P·M HYDRAULIC PRESSES** *to "keep 'em flying"*

To Finish The Job Quicker . . .

LANDIS-SOLEX SIZING ACCOMPLISHES THE UNUSUAL





Within recent months many out-of-the-ordinary grinding problems have demanded solution. The set-up shown above was the Landis answer to one of these.

A bearing manufacturer wished to simultaneously grind the two diameters adjacent to a previously ground raceway, holding them in exceedingly close relationship to the diameter of the raceway. Any slight plus or minus inaccuracy was to be exactly reproduced.

Landis engineers suggested a unique application of the Landis-Solex sizing device and the results have been extremely satisfactory. As indicated by the drawing above, the caliper frame rides on the smaller of the two diameters being ground, while the air outlet is against the raceway. Automatically, and at a high production rate, all raceway diameter variation is thereby duplicated.

Contributing to the outstanding performance of the machine are the many features of the Landis 4" Type H which have made it the preferred grinder in hundreds of America's war plants where high production and extreme accuracy are required. Consider it seriously for your smaller work, whether conventional handling or unusual handling is required.

Unusual Performance As Usual

PRECISION LANDIS GRINDERS

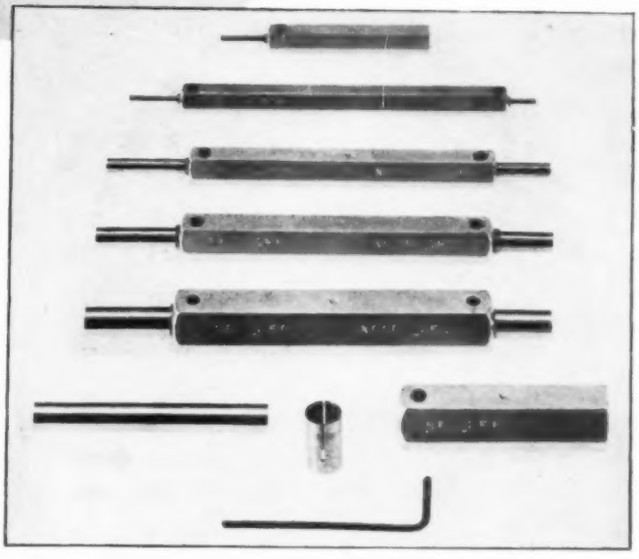
LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.

LANDIS EXCELLENCE

CONTRIBUTES TO VICTORY

405

Van Keuren
WIRE TYPE PLUG GAGES



• • • provide an accurate and low cost means of measuring small holes

Van Keuren wire type plug gages are preferred by large manufacturers and government plants throughout the United States for their features of economy, simplicity of design and accuracy. The 2" long gaging units are usable for the entire length, making the cost per unit extremely low as compared with that of taper insert plug gages. Split bushings and headless set screws clamp the wire units securely in the handle. When a unit becomes worn it may be ground off and a new section moved out. Van Keuren standard tolerance: +.00005"—.00000" on Go units, ±.000025" on No Go units—closer or wider tolerances if required.

We recommend wire type plug gages for checking all holes below .190" diameter.

When writing ask for Catalog No. 31.

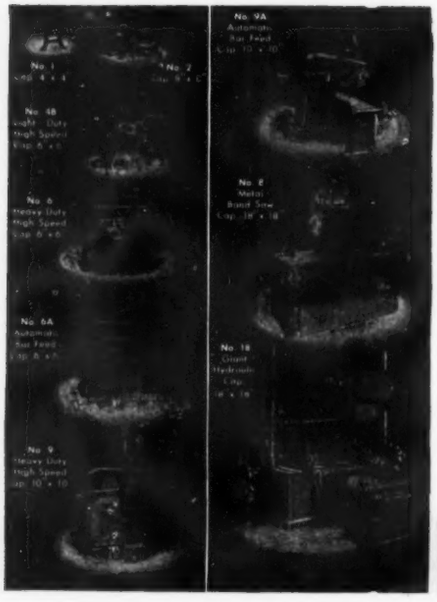
•

WIRE TYPE PLUG GAGE SET No. 60. These gages provide an accurate means of measuring small holes and also standards for checking twist drills in sizes from 1 to 60. (.228" to .040" dia.)

THE Van Keuren COMPANY 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment · Light Wave Micrometers · Gage Blocks · Taper Insert Plug Gages · Wire Type Plug Gages
Measuring Wires · Thread Measuring Wires · Gear Measuring System · Shop Trianales

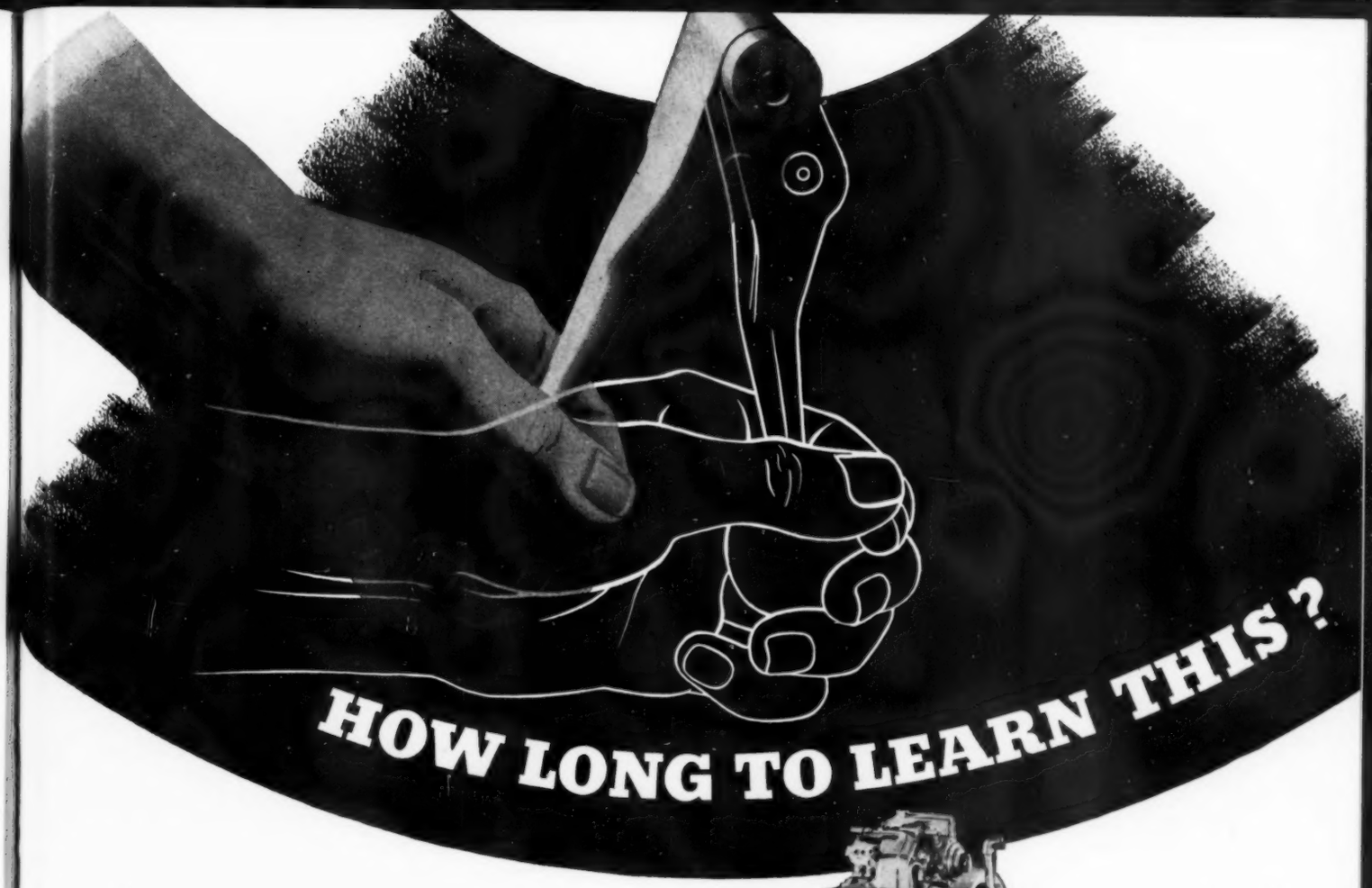
HIGH SPEED *Cutting-off* in the stockroom ends delays and profitless handling



In modern plants everywhere, just as in this large electrical manufacturing plant, it has become part of efficient plant operation to install one or more MARVEL No. 6A or No. 9A High Speed Production Saws right at the stock racks, to end material "bottle necks" and unnecessary materials handling.

With one of these versatile heavy-duty all ball-bearing saws, (the fastest cutting-off machines built) the stockroom can provide single pieces, or quantities of identical pieces, cut-off from bars and tubing on a moment's notice. With no more operator attention than is required by an automatic Screw machine, these Saws will automatically measure, feed and cut-off identical lengths, slices or pieces from single or nested bars. Quantity runs can be interrupted at any point for a miscellaneous cut by simply disengaging the automatic bar push-up.

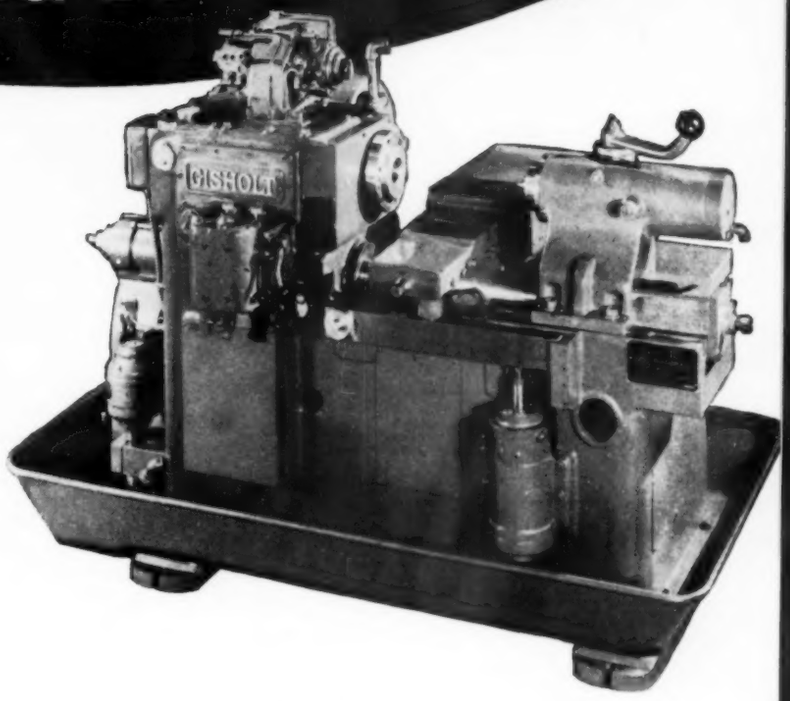
ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N.Y.



HOW LONG TO LEARN THIS?

WITH this one simple control, the operator of a Gisholt Hydraulic Automatic Lathe performs an entire cycle of machining operations. The machine does all the rest—swiftly, accurately—and so completely that one operator can tend two or even three machines.

The fact that very little training is required makes the Gisholt Hydraulic Automatic Lathe an especially valuable wartime tool wherever parts are machined in large volumes.



GISHOLT MACHINE COMPANY

1201 E. Washington Avenue • Madison, Wisconsin

THE GISHOLT HYDRAULIC AUTOMATIC LATHE

—rigidly built for multiple cutting with accuracy at high cutting speeds, handles a wide variety of chucking and between-centers work. Literature on request.

LOOK AHEAD . . . . KEEP AHEAD . . . . WITH GISHOLT *IMPROVEMENTS IN METAL TURNING*

The Army-Navy "E" and the Treasury Flag fly side by side at Gisholt.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

WANT TO STEP UP NIGHT PRODUCTION IN YOUR FACTORY ?

THESE TRUE STORIES TELL HOW OTHER WAR PLANTS HAVE INCREASED PRODUCTION BY MAKING A FEW SIMPLE CHANGES IN THEIR LIGHTING!

Production lagged in a small war factory because inspection work was lagging. Yet new lighting fixtures only recently had been installed. A lighting engineer discovered that glare was the trouble . . . glare from perfectly good lighting fixtures that were so placed that the light hit the inspectors right in their eyes. A simple change in the position of the fixtures opened up that bottleneck and helped increase production immediately.

Something was wrong with the lighting in a big war plant recently converted to the manufacture of army tanks. A lighting man was called in. He made a careful study . . . taking light meter readings here and there . . . and examining the lighting fixtures. Then he cleaned all the bulbs and reflectors in one small section of the plant. Another light meter reading showed the light had jumped from 6 to 25 footcandles. Lighting had been increased four times—just by getting rid of dirt and grease. Today with a regular cleaning program throughout the plant, production has increased.

A small plant recently got an order to manufacture a vital part for machine guns, requiring about 20 milling machine operations. With only a limited number of machines frequent machine settings were required. The plant engineer knew the job could be done faster if his workmen had better light. He installed supplementary lighting over the machines and put larger bulbs in the sockets. Results? The job was done faster and more efficiently, and so the production capacity of the plant was increased.

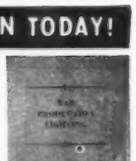
IF YOU ARE RUNNING a wartime shop or factory, why not find out whether good lighting can improve production, cut waste and accidents for you? Even a slight change to eliminate glare or shadows can often make a noticeable difference in night production. Your local electric service company or your G-E lamp supplier can give you helpful advice. Or call your nearest G-E lamp office and they will place a trained Wartime Lighting Counsellor at your service. General Electric Company, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC

TEAR OUT THIS COUPON TODAY!

General Electric Co., Dept. 168-AC-11, Nela Park, Cleveland, O.— Send for new free book, "War Production Lighting" and further information on how light can help increase night shift production.



Name .....

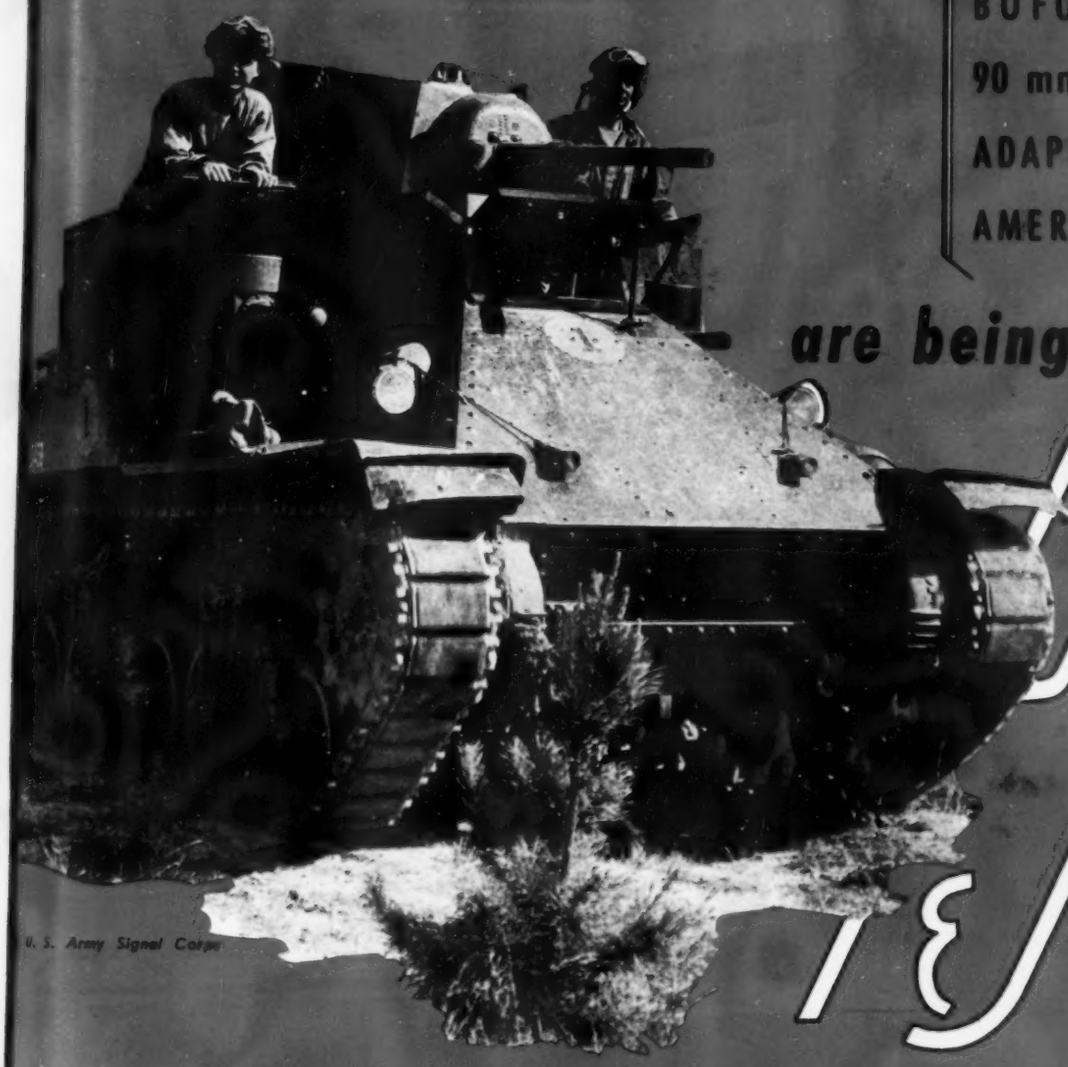
Company .....

Address .....

Duplicate parts for

- AIRPLANES
- AIRPLANE ENGINES
- TANKS
- BOFORS GUNS
- 90 mm. ANTI-AIRCRAFT GUNS
- ADAPTORS FOR SHELLS
- AMERICAN OERLIKON GUNS

are being produced on



U. S. Army Signal Corps

P&J AUTOMATIC CHUCKING EQUIPMENT

in the Arsenals of Democracy

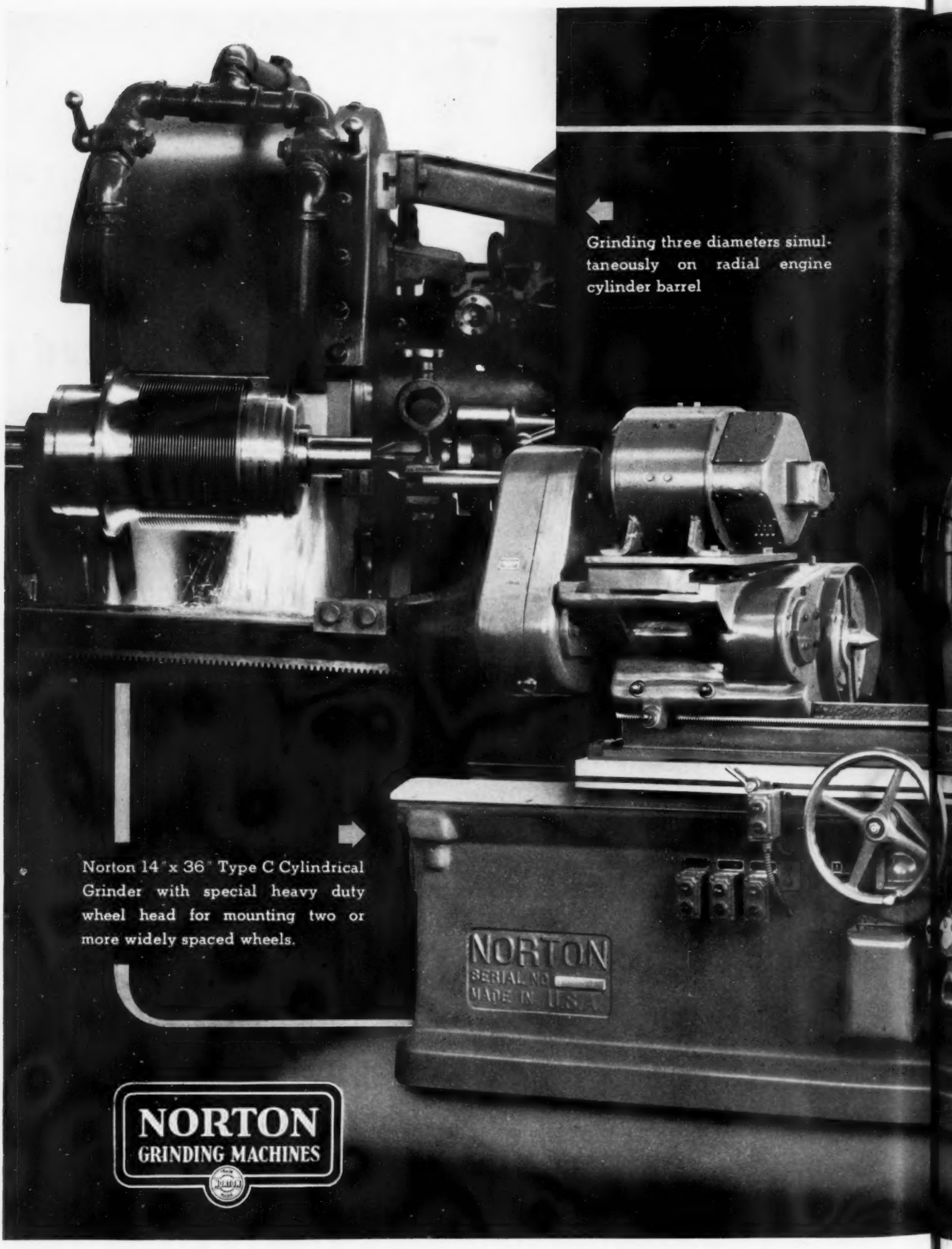
Full speed ahead—the order of the day—is an obligation and a responsibility resting squarely on the shoulders of metal working plants.

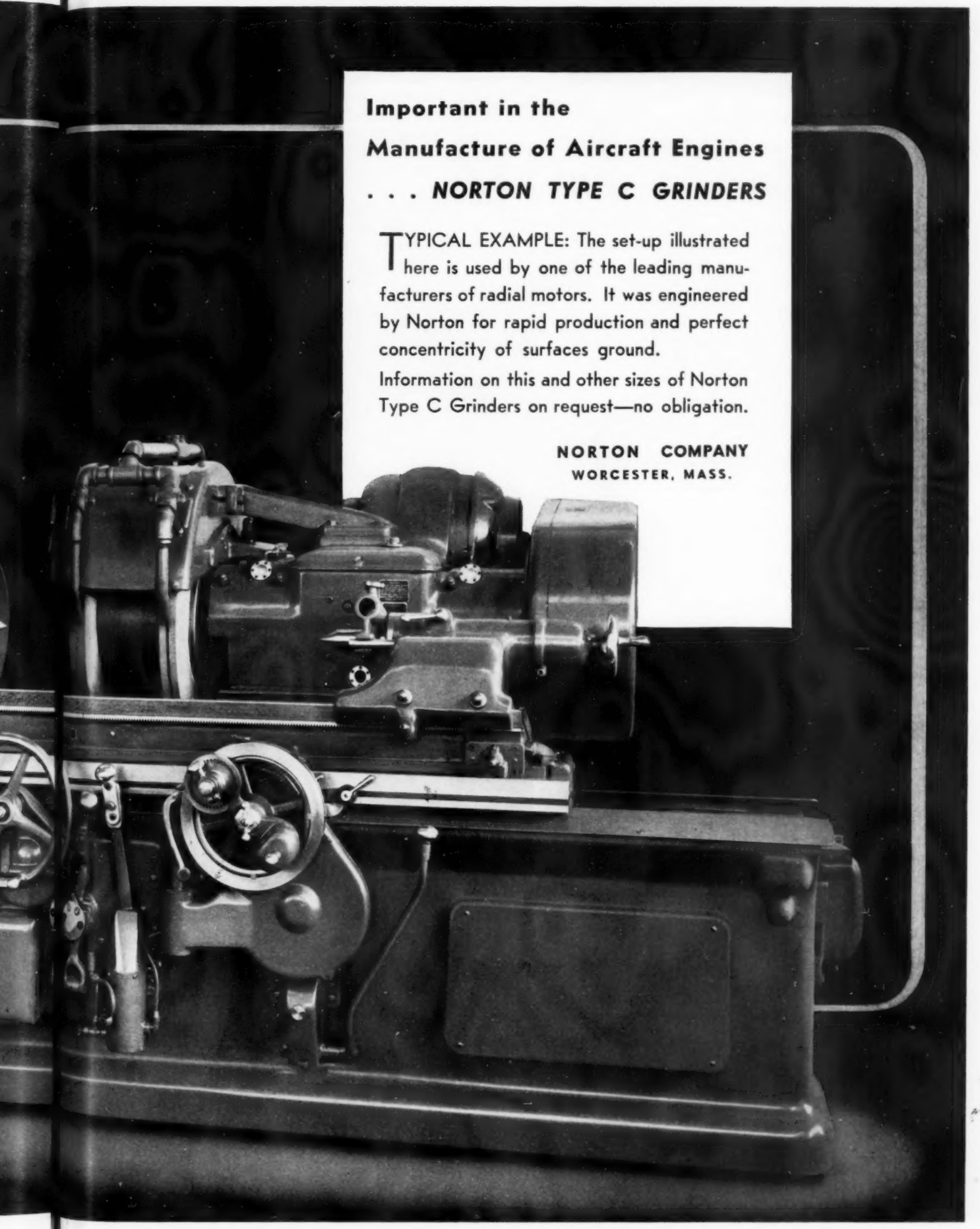
Potter & Johnston Chucking Equipment is helping these plants meet the difficult schedules which are involved in the production of urgent war needs. Demands for increased production have brought many opportunities to the attention of P&J engineers. Long experience and versatility of tooling have made it possible for P&J to render invaluable assistance.

Potter & Johnston is glad to be able to do so much to help speed the Allied war effort.

The POTTER & JOHNSTON MACHINE CO.,

PAWTUCKET . . . . . RHODE ISLAND


Grinding three diameters simultaneously on radial engine cylinder barrel
Norton 14" x 36" Type C Cylindrical Grinder with special heavy duty wheel head for mounting two or more widely spaced wheels.
NORTON
SERIAL NO
MADE IN U.S.A.
NORTON
GRINDING MACHINES



Important in the

Manufacture of Aircraft Engines

. . . *NORTON TYPE C GRINDERS*

TYPICAL EXAMPLE: The set-up illustrated here is used by one of the leading manufacturers of radial motors. It was engineered by Norton for rapid production and perfect concentricity of surfaces ground.

Information on this and other sizes of Norton Type C Grinders on request—no obligation.

NORTON COMPANY
WORCESTER, MASS.

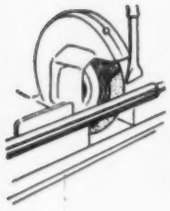
If You Are FORGING Stainless . . .

Reduce rejects by making sure that this metal with low thermal conductivity is preheated *slowly* and brought up to proper forging temperature. Always run furnaces at the proper forging temperature, not hotter. To keep forging operations going at full speed, it may be possible to heat *more* bars and billets at the same time.

Reduce Scrap Loss on FORMING and DRAWING Jobs!

If you are forming or drawing parts from *Sheet,* find out if a narrow Stainless *Strip* of the proper width could help you eliminate slitting and the time spent handling *Sheet.* This *Strip* comes in coils, is easy to use and helps to reduce scrap loss. One plant reports a 40% *material saving* by making this change.

If You Are GRINDING Stainless Steel . . .



When grinding, avoid deep scratches by always using the proper wheel. Don't increase wheel pressure to save time. This overheats the metal and can cause discoloring or distortion. *And always use the proper lubricant.* Your grinding wheel manufacturer can help you make sure that the proper wheel and lubricant are used for each job.

Watch Your TOOL SET-UPS!

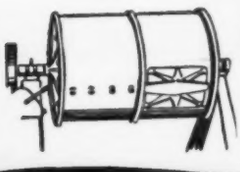
Often a check-up of your tools, die clearances and lubricants will help you keep Stainless Steel parts out of the scrap pile—and increase output from machines and presses. If your scrap pile *continues* to grow, it's time to call in an expert.

What About PRESS SPEEDS?

Only *correct* press speeds boost production and keep rejects to a minimum. Perhaps you should use faster press speeds. Or perhaps a reduction of 10 to 15% would increase output by cutting rejects considerably. Slower press speeds often overcome die galling that interrupts production.

Check the WATER on TUMBLING Jobs!

On tumbling jobs, make sure the water used is "soft". Hard water forms a lime soap, impossible to remove. Balls so coated do not impart a satisfactory finish to the work. Reduce hard water to "soft" water before charging the barrel. This is done by adding 1 oz. of trisodium phosphate per grain of hardness, per 100 gals. of water. Your water company can tell you the grains of hardness per gallon in your water.



HOW TO REDUCE Your Stainless Steel Scrap Loss!

THE time to start salvaging material is *before* it becomes scrap! Stainless Steel is worth more to you and to the war effort in usable strip and bar form, than it is as scrap.

Check *all along the line* for ways to conserve Stainless Steel by reducing scrap loss. Find new ways to reduce rejects that are costly in terms of wasted time and wasted material. Here are a few practical suggestions—to add to the methods you are already using to *get the most from every pound of Stainless Steel.*

6 MORE WAYS TO CONSERVE STAINLESS AND REDUCE SCRAP LOSS

1. An embossed rib will add strength, and may permit the use of lighter gauge strip.
2. Check your physicals. *Undersize* material can cause wrinkling in the die. *Oversize* may explain tearing or galling.
3. Keep dies or draw rings highly polished and smooth.
4. Longer die life and smoother stampings result when draw rings are "finish stoned" with a fine stone—not a wheel.
5. Avoid sharp edges on rolls by using a slight radius.
6. Re-check layouts where parts are stamped from Stainless Strip . . . to reduce skeleton scrap loss.

AND when you have reduced scrap loss to the absolute minimum: salvage the rest. *Nickel and Chromium are VITAL to Victory!*

★ ★ ★

The Carpenter Stainless Selector Slide Chart can give you quick answers to your questions on the grades of Stainless to meet your requirements. It shows the machining, heat and corrosion resisting properties of each analysis of Stainless Steel. A note on your business letterhead will bring you a Slide Chart—free to Stainless Steel users in the U. S. A.

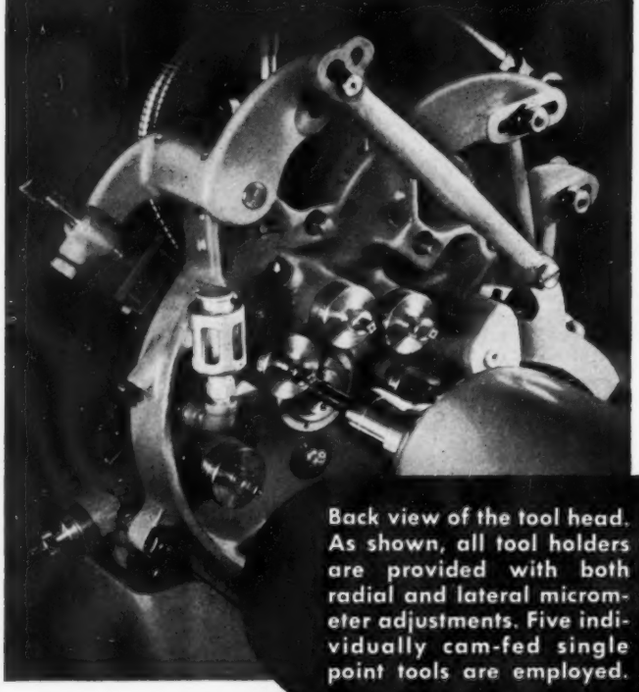
THE CARPENTER STEEL COMPANY
109 BERN STREET • • • • READING, PA.

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

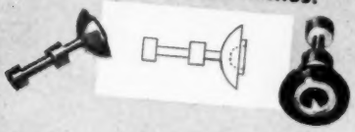
ONE OPERATION *to Produce from Bar Stock*

EXTREMELY ACCURATE HIGHLY FINISHED Parts Such as These



Back view of the tool head. As shown, all tool holders are provided with both radial and lateral micrometer adjustments. Five individually cam-fed single point tools are employed.

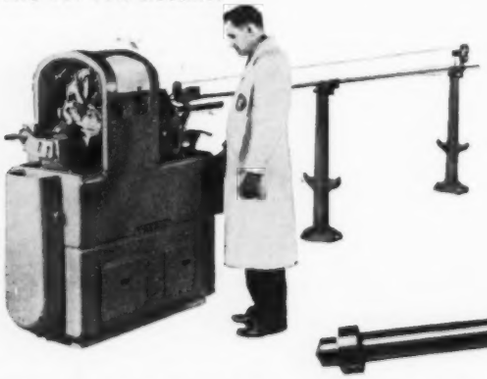
Part—9/16″ long—four diameters between 1/16″ and 5/16″—one formed curved surface — one counterbore formed without use of attachments.
Material—Brass.
Production—120 per hour.
Tolerance— ±.0005″ on all diameters.
Finish—30 to 50 Micro-inches.



Parts shown are actual size

A wide variety of small, accurately finished parts can be produced on a high production basis on the Wickman High Precision Automatic. The collet capacity is up to ½″ diameter. In usual operations, the maximum turning length is 4 inches, although this can be exceeded when parts such as that illustrated below lend themselves to a double feed. 28 spindle speeds up to 7000 R.P.M. and infinite feed rates are available. By the use of attachments . . . supplied as standard accessories . . . drilling, threading, tapping and slotting can be performed on this machine. Write for full details.

Part—2″ long—three diameters between 1/8″ and 5/32″—threads, 32 per inch, produced with self-opening rotary die head mounted on threading attachment—a standard accessory for the machine.
Material—Stainless Steel.
Production—40 per hour.
Tolerance— ±.0002″ on center diameter.
Finish—15 to 40 Micro-inches.



Part—4 7/8″ long—four diameters between 7/64″ and 9/32″—two pivot points—one taper. Double feed is used to secure extra length.
Material—High Carbon Steel.
Production—15 per hour.
Tolerance— ±.0005″ on all diameters.
Finish—25 to 50 Micro-inches.

WICKMAN HIGH PRECISION AUTOMATIC

(SWISS TYPE)

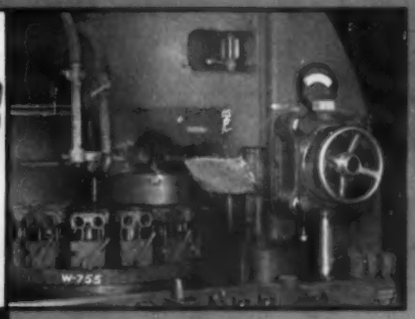
THE Wickman CORPORATION

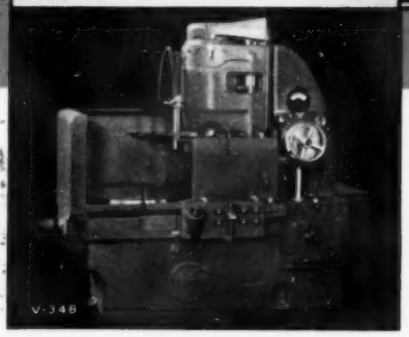
15539 WOODROW WILSON AVE.
DETROIT, MICHIGAN

In Canada—A. C. Wickman Ltd., Toronto; West Coast—Moore Machinery Co., Los Angeles, San Francisco—Branch Offices—Chicago, Hartford.

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING





Oil burner pump parts ground on the Blanchard No. 18 Surface Grinder.

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

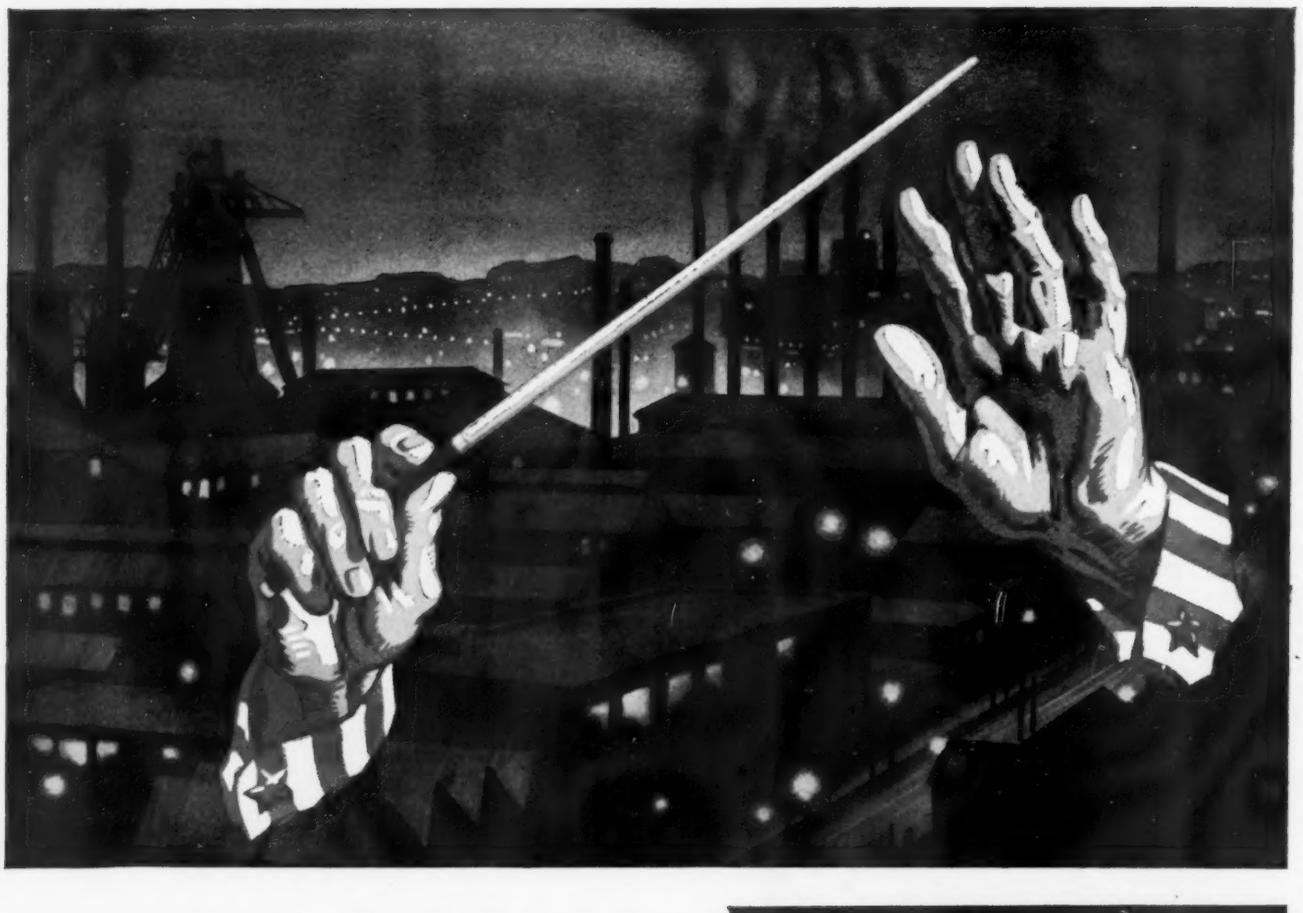
THE BLANCHARD NO. 18 SURFACE GRINDER is used to rough and finish grind the oil burner pump parts shown above. They are first ground from the rough, then they are normalized and ground again. All boring and drilling operations are located from the flat Blanchard ground surfaces. After machining, all parts are finish ground on the Blanchard. Twelve pump bodies are ground at once on fixtures mounted on one base plate. The base plate is held magnetically, therefore the chuck may be cleared quickly for a change of jobs. The cast iron pump bodies are 6 inches in diameter. .012″ of stock is ground off one side to limits of +.0003″ —.0001″ at a rate of 48 pieces per hour.

★ . . . . . *Especially valuable on jobs like the one illustrated.*

The **BLANCHARD MACHINE COMPANY**
64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



Prelude to PEACE

In the Prelude to the Peace for which we strive, the dominant note is the rhythmic hum of coordinated production. Day by day the pitch becomes higher, the beat faster, the sound louder and more inescapable. • In our own plants this sound is unmistakable. There's the vibrant feel of smoothly functioning production in the air. There's the look of it in the eyes of the men. Coordination has everywhere replaced confusion. Confidence has everywhere replaced uncertainty. There's Victory in the air. And Victory is the Prelude to Peace.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

The Army-Navy "E" for excellence means to the Bullard workers that they are Industrial Soldiers backing up the Armed Forces—those Soldiers at the front.

Such a spirit of true Americanism reflects itself not only in speeded-up Production but also in the workmanship which goes into every Bullard Mult-Au-Matic and Vertical Turret Lathe. They're built to do the jobs faster and more accurately so that the boys at the front may have confidence in the tanks, guns, planes, and other equipment which Bullard machines have helped to build.

BULLARD

BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

QUICK, EASY TOOL CHANGES

Highly Versatile Knee-type HydrOILic Press

The time you save in switching tools, fixtures, bolsters or supports from one job requirement to another is just *one* advantage this DLKC2 HydrOILic Press offers. Another is the smooth, flexible accuracy of its *oil hydraulic* operation—you can quickly adjust its power and control to meet varying requirements, and be sure of hairline precision on each job. And the compact, safety-cornered frame fully encloses and protects the operating mechanism, clearing the way for *safe*, high-speed operation. Equally suitable for production-line pressing jobs, the knee-type press is built in 5- and 15-ton capacities, with manual or electric controls. It has a maximum stroke of 30 inches; a daylight opening of 46 inches. Write today for details, or call your Denison representative.

Priorities still have first call on HydrOILic Press output. But since conditions may change rapidly we suggest you submit your requirements to us without delay. We will tell you promptly the delivery we can make in your particular case.

OPERATION

When the ram is at the limit of the up-stroke, the shipper rod holds the control valve in neutral position. Down movement of the control lever causes the shipper rod to rise, throwing the control valve into "starting" position. The ram then lowers until it reaches the limit of the down stroke (not standard on electrically-controlled press) which is controlled by a "stop" on the shipper rod. This forces the shipper rod down, throwing the control valve into neutral position. Releasing the control causes the ram to move up. When the ram reaches the "up" limit, the cycle is completed. The ram is then hydraulically held in position and the pump freely circulates its volume, consuming minimum HP. If the work is contacted before the lower stroke limit is reached, the press will continue to exert tonnage against the work until the controls are released. Tonnage can be adjusted from the maximum rating to approximately 10% of maximum.

DIMENSIONS

	DLKC 2-5				DLKC 2-15			
A	12	18	24	30	12	18	24	30
B	6	6	6	6	6	6	6	6
C	18	24	30	36	18	24	30	36
D	10	10	10	10	10	10	10	10
E	91	91	97	103	96	96	101½	107½
F	8	8	8	8	8	8	8	8
G	4½	4½	4½	4½	4½	4½	4½	4½
H	12½	12½	12½	12½	13¼	13¼	13¼	13¼
J	29	29	29	29	31¼	31¼	31¼	31¼
K	40	40	40	40	47¼	47¼	47¼	47¼
L	11⅝	11⅝	11⅝	11⅝	13⅝	13⅝	13⅝	13⅝
M	25	25	25	25	29	29	29	29
N	14	14	14	14	14	14	14	14
O	46	46	46	46	45¼	45¼	45¼	45¼
P	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
Q	21	15	9		21	15	9	
R	8	8	8		8	8	8	
S	21	21	21	21	25	25	25	25
T	6	6	6	6	6	6	6	6
V	5½	5½	5½	5½	7¼	7¼	7¼	7¼
W	2850	2950	3050	3150	5150	5200	5300	5400
X	2900	3000	3100	3200	5200	5250	5350	5450
Y	3000	3100	3200	3300	5300	5350	5450	5550
Z	126	126	133	140	158	158	175	186

SPECIFICATIONS

	DLKC2-5	DLKC2-15
MAXIMUM WORKING CAPACITY, TONS	5	15
CYLINDER BORE INCHES	3.75	6
RAM SPEED DOWN FT. PER MIN.	19	19
RAM SPEED UP FT. PER MIN.	42	35
PUMP VOLUME GALLONS PER MIN.	11	28
MAXIMUM WORKING PRESSURE P.S.I.	900	1060
MOTOR HP 1200 R.P.M.	5	15
RAM DIAMETER INCHES	2.75	4.25
RAM THREAD FEMALE SIZE, PITCH	1¼–12	2–8
OIL RESERVOIR CAPACITY, GALS.	35	50

Wherever You Need POWER, SPEED and CONTROL Check ✓

DENISON EQUIPMENT in APPLIED HydrOILics

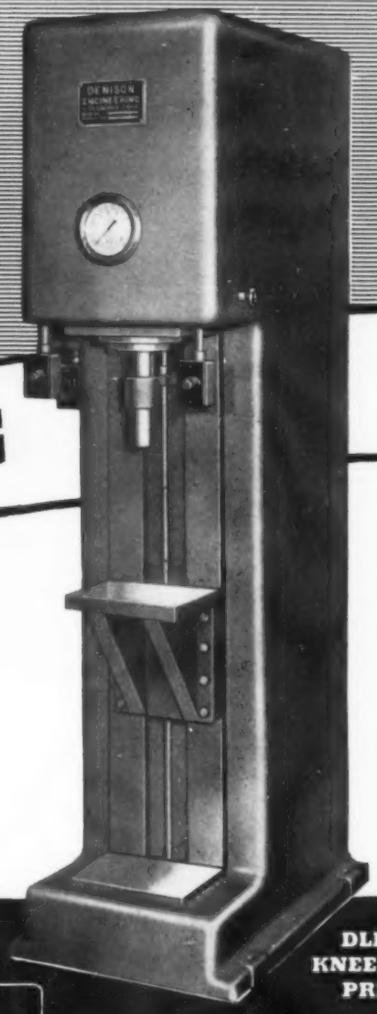
TRADE MARK

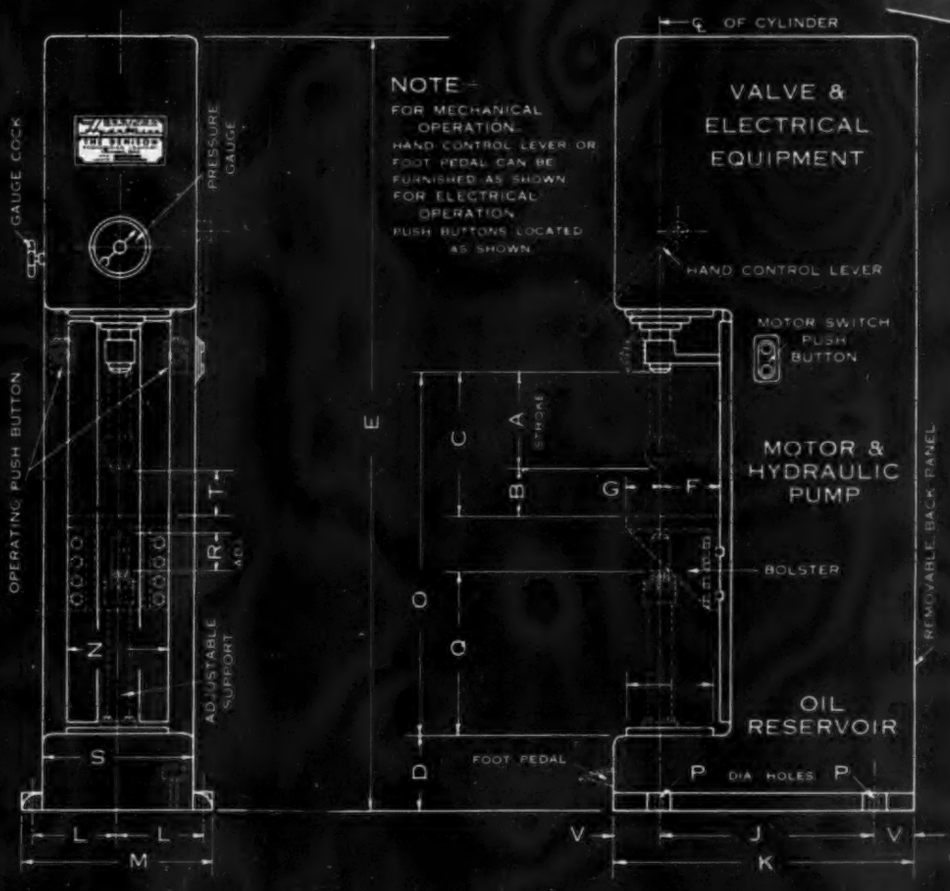
The 116

SPEED SMALL-LOT PRESSING

The DLKC2 5- and 15-ton Capacities

HAVE YOU sent for your free copy of the new DATA BOOK on Denison's full line of 5-to-100-ton HydrOILic Presses for straightening, assembling, bending, broaching and other pressing operations? It is pointing the way to better pressing results in hundreds of plants. Also contains 12 full pages of useful engineering data! A request on your business letterhead will bring it by return mail. Write today!





DLKC2 KNEE-TYPE PRESS

CAPACITIES: 5 and 15 TONS

MANUAL OR ELECTRIC CONTROLS

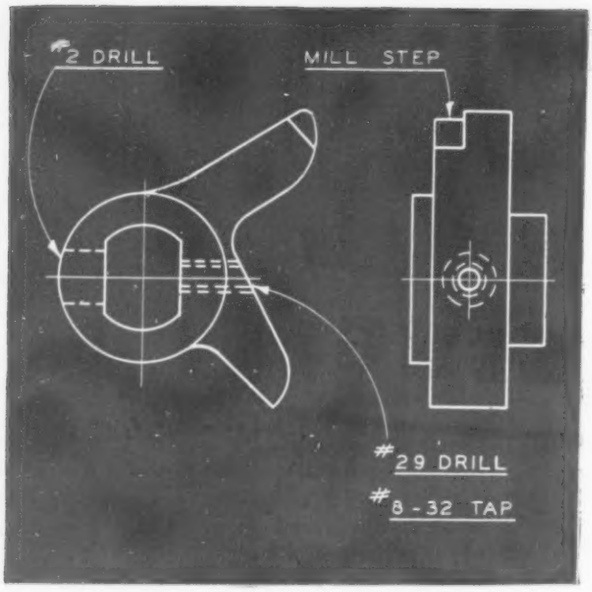
MAX. WORKING PRESSURE: 1,060 p.s.i.

MAX. STROKE 30"

MAX. THROAT OPENING: 8"

MAX. VERTICAL OPENING: 46"

DENISON ENGINEERING COMPANY
Dublin Road **Columbus, Ohio**



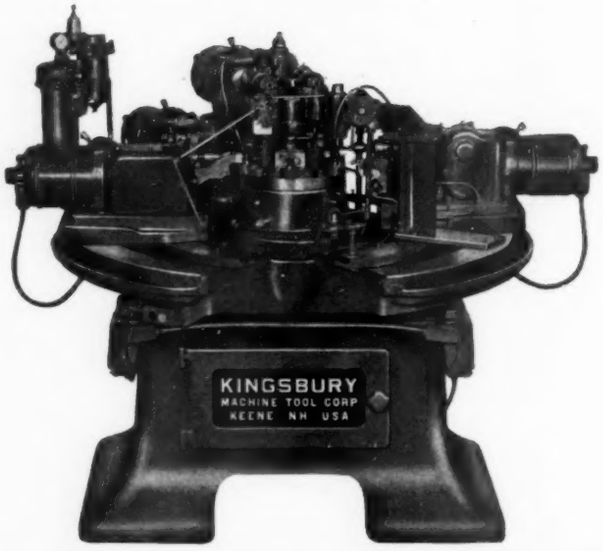
THIS IS A
FLEXIMATIC
AUTOMOTIVE
JOB!

FLEXIMATIC
by KINGSBURY

. . . . Flexible, Automatic, and Fast . . . !

Even such a small part as an automobile door latch presents an opportunity for savings when a Kingsbury FLEXIMATIC is used to produce them. The machine illustrated performs four operations—drilling two holes, tapping and milling—finishing these brass forgings at unbelievably high speeds. And, adding to the ease and economy of FLEXIMATIC operation is the fact that this machine doesn't even have to be unloaded! The operator merely loads the work and clamps it. It is automatically unclamped and ejected.

Kingsbury FLEXIMATICS are made up of standard units for drilling, milling, tapping, etc.—as many as necessary—mounted in any position on one of several types of standard bases. This Kingsbury method of standardizing the various units of assembly results in a machine that can easily be changed to meet changes in design and production . . . a FLEXIBLE, an AUTOMATIC, a FAST production machine.



KINGSBURY MACHINE TOOL CORPORATION
KEENE · NEW HAMPSHIRE · U S A

MID-WEST ABRASIVES *Nearly Doubled* THIS MANUFACTURER'S STRUT PRODUCTION!

Is Faulty Honing Retarding Your Production?

The XYZ Corporation, building chrome molybdenum landing gear shock struts for Uncle Sam, had their hands full of honing trouble — until they switched to MID-WEST abrasives. Now the struts are honed to a finish far in excess of inspection limitations and, what is more important, production of the struts has been almost doubled.

XYZ engineers were using one stone for roughing and another for finishing, which was perfectly all right except for the fact the finishing stone was generating too much heat and causing distortion of the work. At times this distortion was being carried to a point where the cylinders were .005" out of round whereas the inspection limit was .001".

A MID-WEST sales-engineer was consulted and, at the company's invitation, he experimented with stones of various hardness and grain structure. As a result of these tests he recommended the use of MID-WEST 500-48X stones for both roughing and finishing, it being proven that the stone removed stock rapidly and created a smooth finish as well.

During actual production use subsequently the MID-WEST 500-48X stone, operating on thin-walled tubes, has removed stock quickly, held the bores to within .0002" in both roundness and taper, and done so without generating heat and without danger of distortion. The additional speed of this stone, plus the fact the honing is now done in one operation instead of two, has enabled the corporation to increase production to a point where it has almost doubled.

The adoption of MID-WEST abrasives banished a lot of honing headaches for XYZ engineers. They can do as much for you. Our engineers, located in all large cities, will be glad to cooperate with you.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE — DETROIT, MICHIGAN

Mid-West

- ★ *Honing Stones*
- ★ *Superfinishing Stones*
- ★ *Grinding Wheels*
- ★ *Emery Cloth*
- ★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

*Name*_____

*Company*_____

*Address*_____

CONSERVE CRITICAL MATERIALS— GET BETTER RESULTS

with "THE VICTORY STEEL"

Graph-Mo Steel will outwear competing oil-hardening tool steels and will machine at least 25% faster than competing steels.

Now add to this the saving in critical materials that is obtained from the use of Graph-Mo Steel and you will understand why it deserves to be called "The Victory Steel."

As revealed in this chart, Graph-Mo uses no Chrome, no Vanadium, no Tungsten, no Manganese, and only .25 Molybdenum.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

PERCENTAGE OF ALLOYS IN OIL-HARDENING TOOL STEELS COMPETITIVE TO GRAPH-MO

Steel	Silicon	Molybdenum	Chromium	Vanadium	Tungsten	Manganese
A		.20				1.60
B				.20	1.25	
C			.50		.50	1.20
D			.70		.50	1.00
E			.50	.20	.50	1.20
F			.50	.25	.45/.75	1.20
G						1.50/1.80
H			.50	.15	.30	1.30
I			.70	.11	.50	1.30
J			1.60		.45	
K			1.20	.20		.90
L			.27	.25		1.70
M			.40	.10		1.30
N			.60		.40	1.20
O			.50		.50	1.05
P			.50		.50	1.15
Q			.50	.25		1.25
R			.50		.50	1.20
S			.20			1.65
T			.50		.50	1.20
Graph-Mo	.75/.85	.25				

SAVING IS FIGHTING
Graphitic Steels are in the front line of the conservation battle — will be doing a first rate constructive job in post-war competition — start using them now!

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

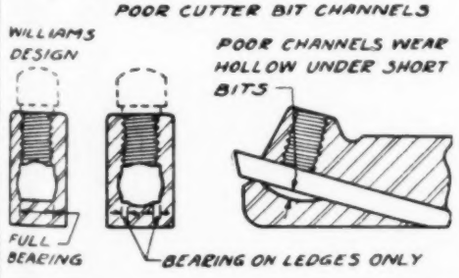
HOW AND WHY
WILLIAMS' TOOLS AID WAR PRODUCTION

J. H. WILLIAMS & CO., *Drop-Forgings and Drop-Forged Tools*, BUFFALO, N. Y.

DATA ON WILLIAMS' TURNING-TOOLS

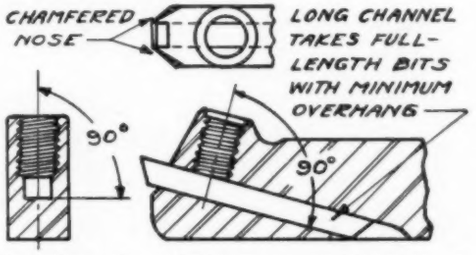
Since metal turning constitutes a major operation in our war production program, consideration of available tools for this purpose is timely. The Tool Holder system offers definite advantages over solid, forged tools for lathe, planer, shaper, etc. Greater convenience, efficiency and economy result with the use of properly designed Tool Holders, which save practically all waste of costly high speed steel, eliminate all dead stock of heavy forged tools, do away with all blacksmith labor and much grinding, and reduce lost man and machine hours waiting for tools substantially to zero.

Tool Holders, however, to satisfactorily replace solid forged tools, must be engineered to withstand the severe treatment which modern metal turning imposes on the cutting tool. Williams' Holders are drop-forged from a specially selected grade of steel, treated and hardened to develop maximum resistance to all wear and insure a hard rigid seat for the cutter directly under the holding or locking device. This tends to prevent cutter breakage which is due largely to the recess or pocket formed by short bits being forced into the cutter seat of the holder when the shank has not been properly hardened.



The bottom face of the shank of all Williams' Holders is rechecked after heat treating to insure a flat, square surface for the holder to rest on.

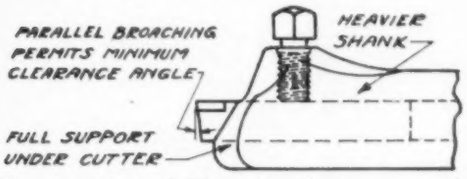
In Williams' Turning Tool Holders the nose is chamfered to permit convenient use in close quarters where space is limited. Set Screws are located at exact right angles to the cutter bit channel to provide full contact of the point of the screw with the cutter bit and insure maximum holding power. Screws and tapped holes are held to the close fits essential for long life under gruelling tool holder service.



Sketches above illustrate a straight shank Williams' Turning Tool Holder. Note that the extremely long cutter bit channel extends thru the bottom face of the shank, providing maximum entry for the cutter bit. This feature assures minimum overhang when a *full-length* bit is used, thus reducing the danger of cutter bit breakage.

Carbide Turning-Tool Holders

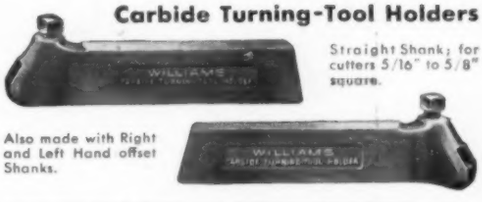
Since tungsten carbide cutters approach a diamond in hardness (88-92 Rockwell A), the brittle nature of this material makes it absolutely essential that the cutter bit be held rigid and the cutting edge supported as much as possible.



To provide a rigid tool and assure maximum support of the cutter, the shanks of Williams' Carbide Holders are made heavier and longer than regular Turning-Tool Holders of equal cutter capacity. The cutter channel is broached parallel with the base of the shank rather than at the usual 15° angle. The parallel broaching of the cutter slot permits proper grinding of the cutter so as to give maximum support to the cutting edge.

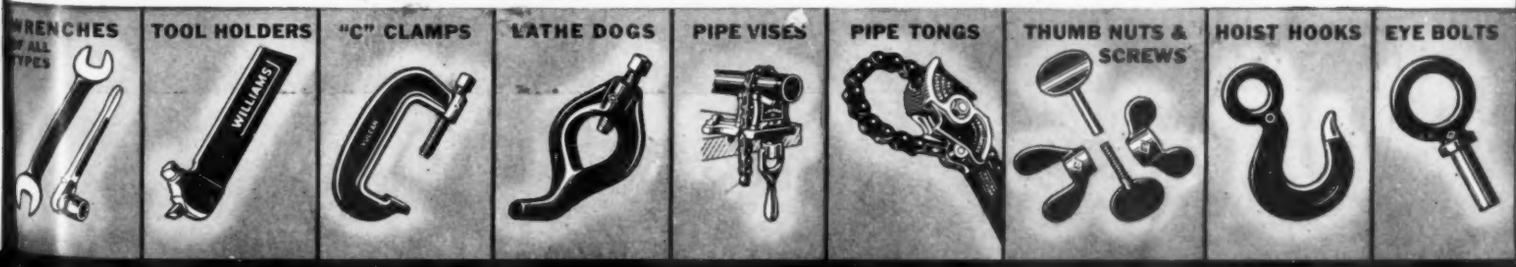
Regular Turning-Tool Holders

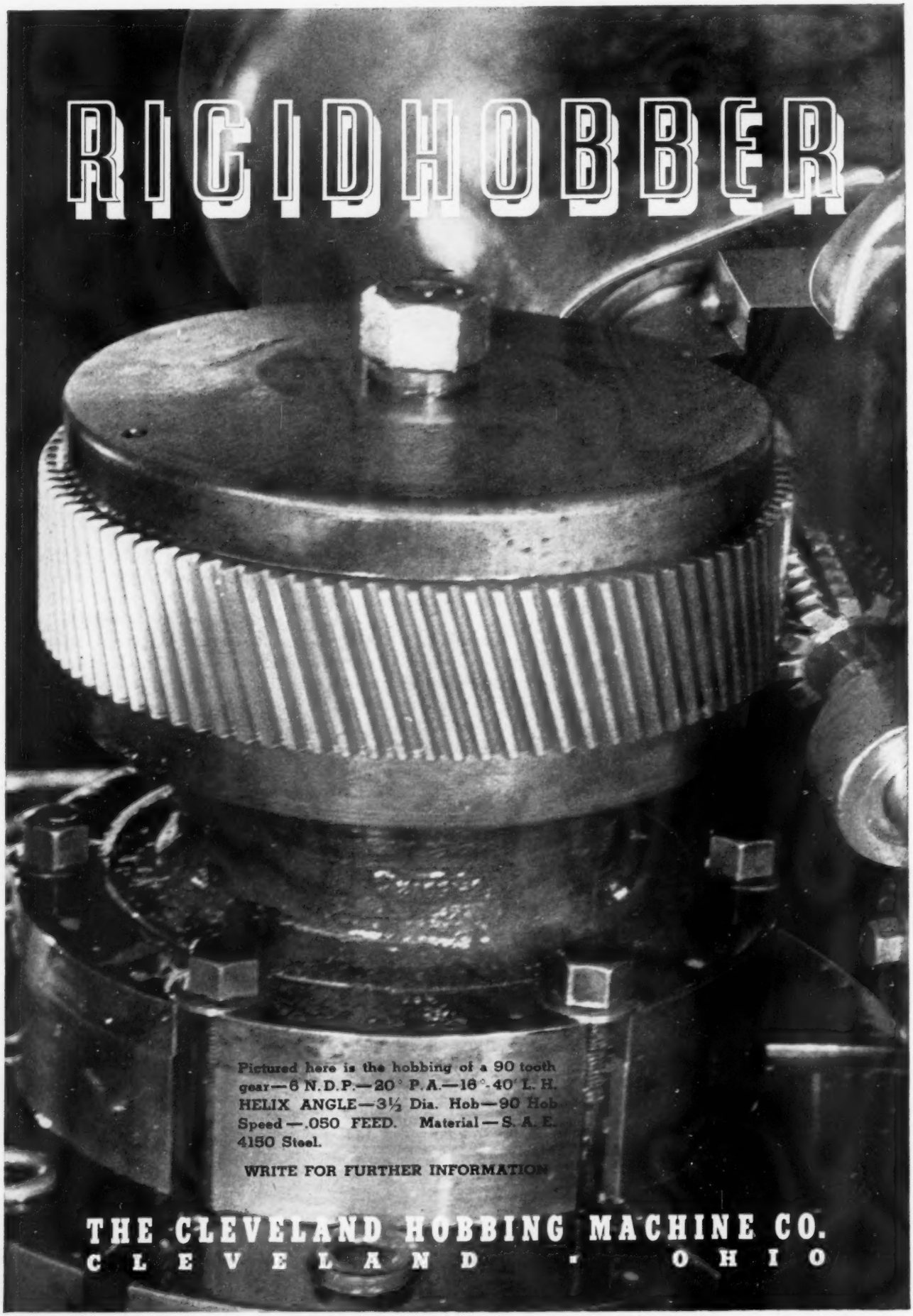
Carbide Turning-Tool Holders



WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters for over half a century for
DROP-FORGINGS and DROP-FORGED TOOLS

Sold by Leading Industrial Distributors Everywhere




RIGIDHOBBER
Pictured here is the hobbing of a 90 tooth gear—6 N.D.P.—20° P.A.—16°-40' L.H. HELIX ANGLE—3½ Dia. Hob—90 Hob Speed—.050 FEED. Material—S.A.E. 4150 Steel.
WRITE FOR FURTHER INFORMATION
THE CLEVELAND HOBBING MACHINE CO.
CLEVELAND · OHIO

"THAT CREATIVE TALENT MAY NOT PERISH FROM THE EARTH"

We are playing our part in the inspired symphony of martial production to speed the day when all men everywhere, regardless of race, creed or color, may again be free to create, to interpret and to enjoy!

In recognition of the production achievement of the Carlton Machine Tool Company the Army-Navy "E" Flag for production excellence was awarded in a colorful ceremony August 27, 1942.

Highlights of the ceremony are depicted in the photographs.

ARMY E NAVY

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI - - - OHIO

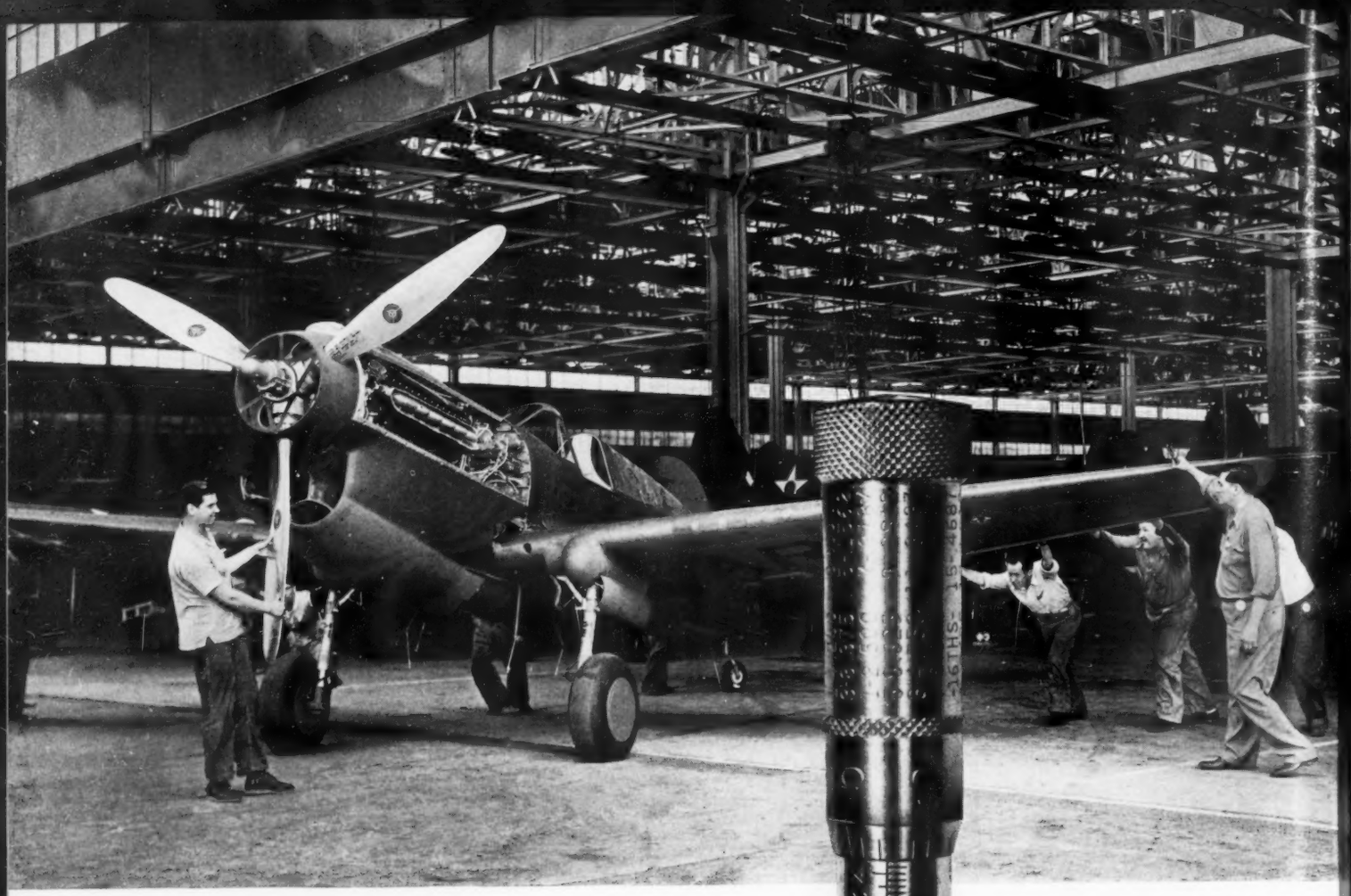


Photo Courtesy Airplane Division
Curtiss-Wright Corp.

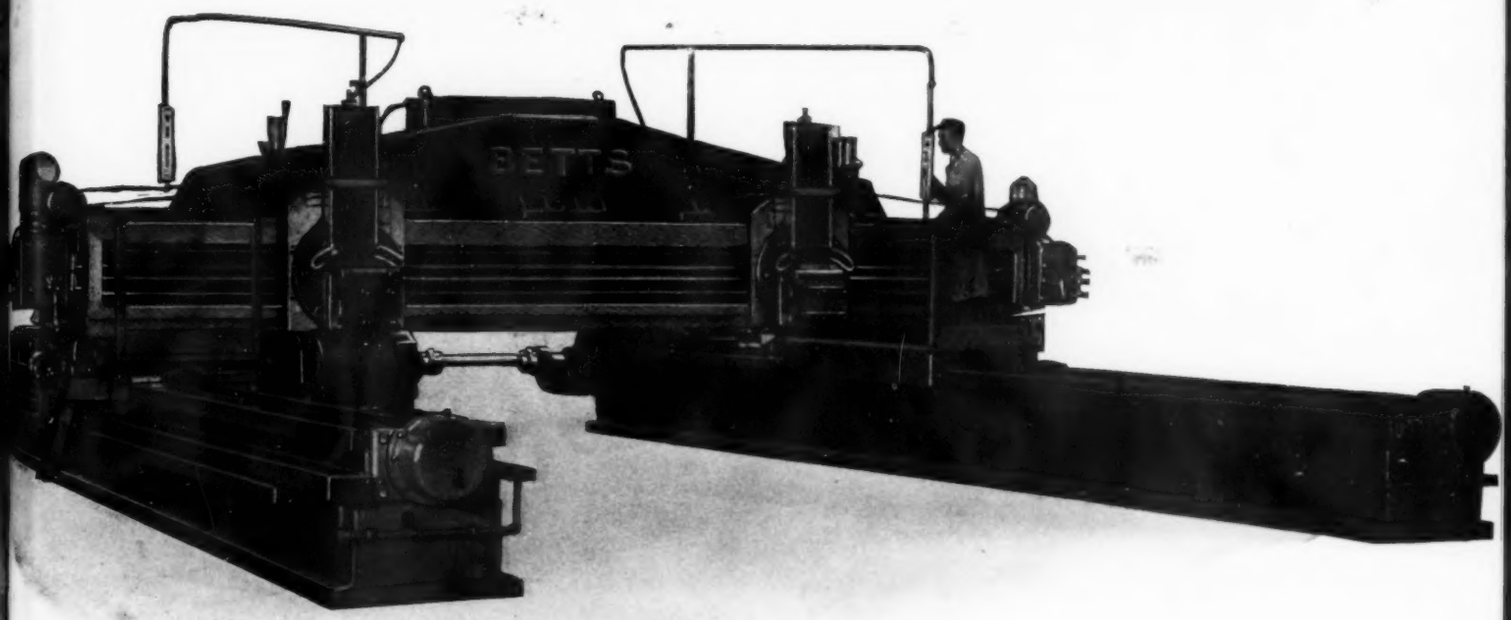
ANOTHER ONE! THAT WILL PROVE SLOCOMB ACCURACY

Another pursuit plane rolls off the assembly line! . . . and its performance in the air will be final proof of the accuracy of Slocomb Micrometers which guarded the precision manufacture of many of its vital parts. Chosen for their lasting dependability under conditions of daily use, Slocomb Micrometers are maintaining a constant watch over all types of aircraft manufacturing operations, insuring the accuracy of measurements from .0001 to 60 inches. An exclusive Slocomb feature—the all tool steel screw with four times the bearing surface of other micrometers—is responsible for their durability . . . for their longer-lasting accuracy wherever accuracy is vital!

J. T. SLOCOMB COMPANY
PROVIDENCE, R. I.

OFFICE ADDRESSES: NEW YORK, 125 Barclay St.—CHICAGO, 564 W. Randolph St.—CLEVELAND, Hal W. Reynolds, 3346 Superior Ave.—DETROIT, 4484 Cass Ave.—SAN FRANCISCO, 121 Second St.—LOS ANGELES, 524 E. Fourth St.—SEATTLE, 568 First Ave.—DENVER, 2217 East 24th St.—SYRACUSE, 274 Croly St.—CANADA AND MARITIME PROVINCES, Arthur Jackson Machine Tool Co., 60 Front St., W., Toronto.—CHINA, INDIA, CEYLON, SOUTH AFRICA, AUSTRALIA, NEW ZEALAND, PALESTINE, Dodge & Seymour, Ltd., 53 Park Place, New York, N. Y.

"A LIFE SAVER"



That's the way one of these machines was referred to recently in one of the large defense plants where one was installed last February.

They said, "We would not know what to do without this Planer, it certainly is a life saver."

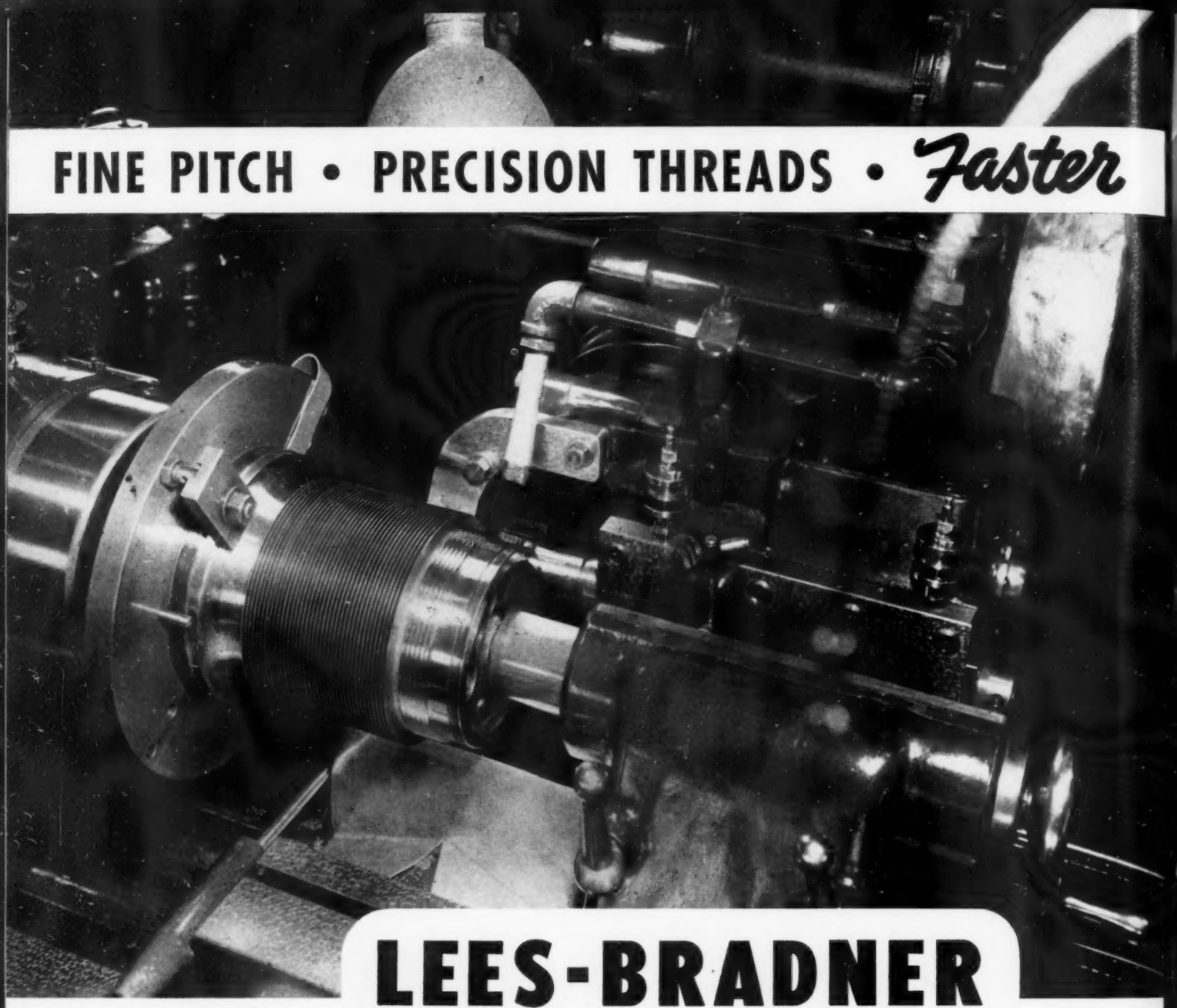
BETTS PIT TYPE PLANERS

are life savers in our war effort because of the variety of large work they will handle efficiently and the speed with which they can be built.

Information on these Planers will be furnished on request.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK



FINE PITCH • PRECISION THREADS • *Faster*

LEES-BRADNER
• THREAD MILLERS •

Again Lees-Bradner demonstrates its ability to produce difficult, fine pitch, precision threads at high production rates. Here the Lees-Bradner H. T. Thread Miller is generating extremely accurate threads on one of the components of a radial aircraft engine in the plant of one of America's outstanding builders of airplane motors at a production rate far greater than previous methods. It will do the same for you.

The **LEES-BRADNER** *Company*

CLEVELAND, OHIO, U.S.A.

FOSDICK

"One of the best of all the Radials we have"

● This statement from the foreman of a prominent manufacturer of Grinding Machines indicates the growing appreciation of Fosdick Hydraulic Radials by the men using them.

Here various operations are being performed on a total of 30 holes in a cast iron hand table traverse apron for a 10" Type C Hydraulic Cylindrical Grinding Machine at the rate of one piece per hour.

Two set ups are required of jig locating holes on four sides of the work and a clamp on work table handle the remainder.

Operations are as follows—

Drill and tap—11 holes 5/16"—18x⅝"
Tap 17 holes—other sizes standard thread
Tap 2 holes—⅛" pipe thread
Ream 1 hole—1" dia., 2 holes—½" dia.
1 hole—drawback spot face
1 hole—spot face
5 holes—counterbore

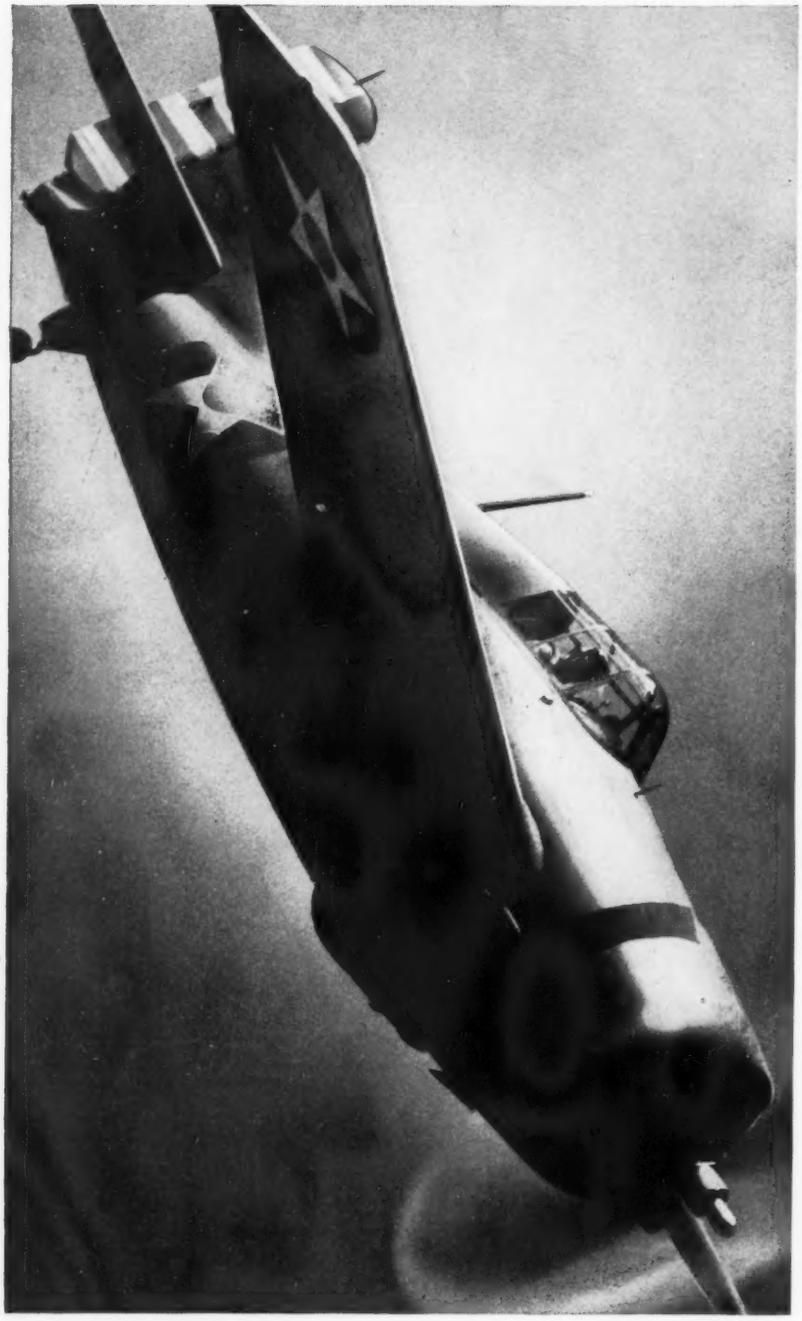
After two years of constant operation under strenuous war conditions the foreman speaks of the following features as contributing to the success of this Fosdick Radial on their work. "Heavy, ball bearing spindle is very accurate—Centralized controls provide all necessary operating speeds—Large diameter column and arm section prevent deflection."

Put your Radial jobs on a Fosdick Hydraulic Radial and get these advantages and many more, resulting in greater production—precision work—low cost operation.

Bulletin Fosdick Hydraulic Radials RA gives complete details. Write for one.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI ··· OHIO

DIVING SPEEDS require *Extra Safety*



. . . as with

MICROHONING

When *diving motors* "rev" up to 5600 r.p.m., the entire success of a mission may depend upon having an extra margin of safety in critical bearing surfaces. These surfaces are not completely safe unless extremely accurate, and "structurally perfect"—entirely free of microscopic cracks and disturbed subsurface material which induce fatigue failure.

MICROFINISH HONING is providing such surface quality in regular high production because—

It does not generate injurious frictional heat—hence avoids cracks.

It does not disturb or weaken subsurface material.

It corrects error and generates accuracy.

It generates any desired type or degree of controlled surface finish smoothness.

It provides all these advantages under the control of a single process.

Micromatic

HONE CORPORATION

DETROIT, MICHIGAN

Manufacturers of Honing Machine Tools

MICROHONING
is used to finish

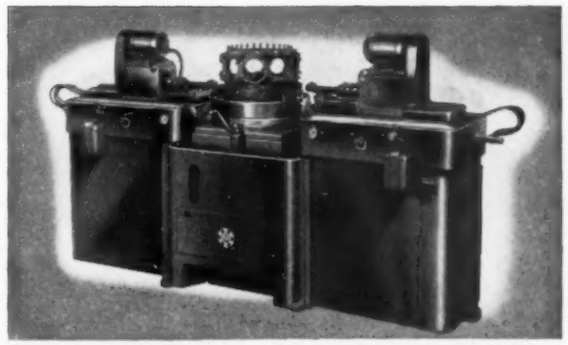
Gun Barrels—before and after rifling—diameters .303" to 18" and lengths up to 75 feet • Gun Recuperators and Engine Cylinders • Wrist Pins • Valve Guides • Con Rods • Bearings • Pneumatic and Hydraulic Cylinders—and many other precision parts for ordnance, aircraft, automotive equipment, tanks, machine tools, etc.

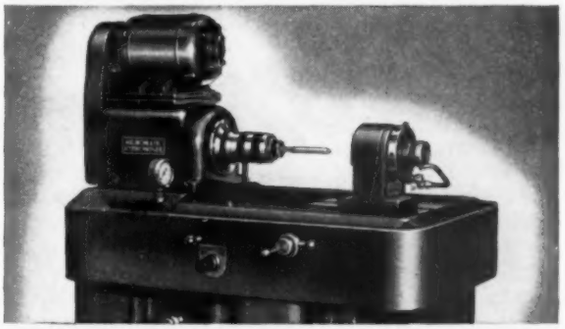
Phone
DETROIT
TRINITY
1-1300

MICROHONING *is now used to generate finished surfaces in many parts—in bores, on shafts, pins, etc.*

SAVE TIME
SAVE METAL
SAVE COST
IMPROVE QUALITY

ENGINES • Honing Valve Guides after assembly in crankcase (Radial Aircraft Engine) on double-end Hydrohoner with Microsize Control. Production—3 to 6 complete assemblies per hour—removes average of .0005″ to .001″—generates uniform size within .0003″ to .0005″, accuracy within .0001″ to .0003″, and surface finish within 3 to 5 microinches r.m.s.



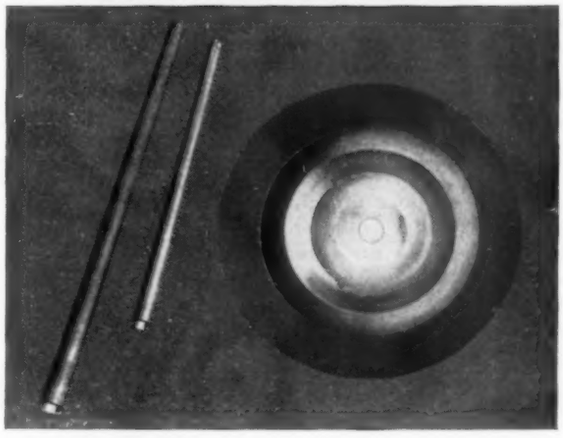


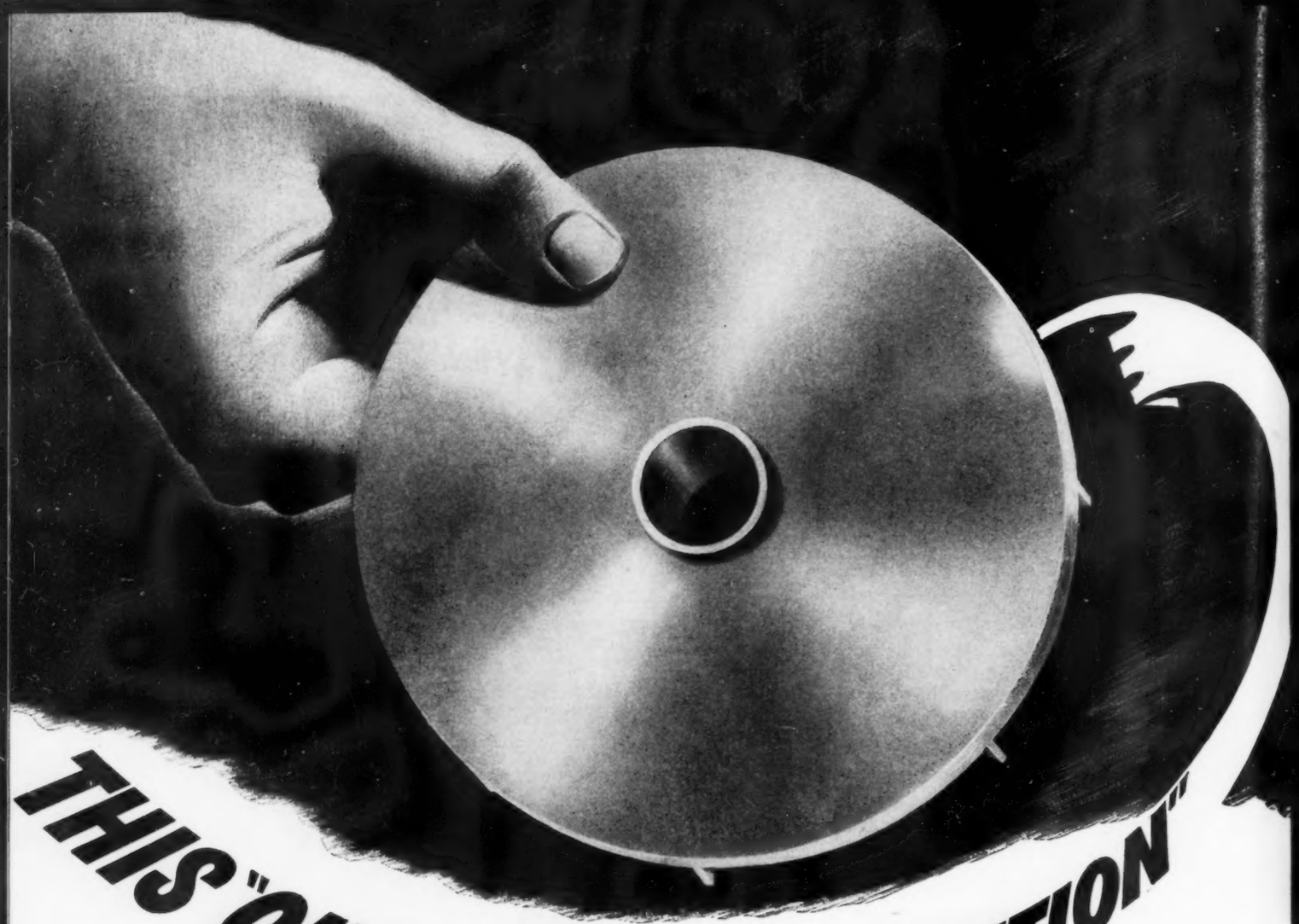
HYDRAULICS • Honing O.D. of pistons for a variable delivery hydraulic pump —with the unusual feature that half the piston surface area is hardened, half is soft.

ORDNANCE • Typical gun barrels regularly honed in production include 50-caliber machine guns—20-millimeter cannon as well as other and larger calibers up to and including 16″ and 18″, and from 30 inches to 75 feet in length.

External honing of recoil piston rods generates accuracy within .0001″ to .0003″ and any desirable finish.

Internal honing of recoil cylinders generates round and straight accuracy within .0005″ to .0007″—and the exceptional "co-directional" draw-finish demanded by such service.



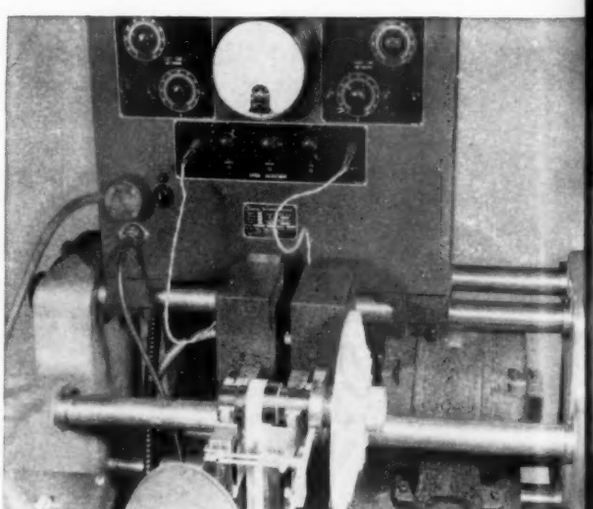


THIS "OUNCE OF PREVENTION"

...weighed only 1/35,000 lb.!

YOU might never have noticed this slightly burnished spot where 1/5 grain of metal has been removed! But that makes it no less important. Accurately located, it corrects the balance of this super-charger impeller for one of Uncle Sam's fighting planes—to prevent vibration when it is "revved" up to such terrific speeds as 30,000 r.p.m. Without it, you'd have the throb of unbalanced forces, putting heavy strain on bearings, impairing efficiency, inviting trouble!

It is doubtful whether such a fine degree of static and dynamic balance could ever be attained without the aid of Gisholt Dynetric Balancing Machines. Certainly it could not otherwise be done so quickly and easily. For this machine, by picking up unbalance vibrations and electrically amplifying them 1,600,000 times, locates and measures them in a matter of seconds. It's the modern, low-cost way of assuring better performance and longer life in any high-speed rotating part.



DYNETRIC BALANCING MACHINES *are built in various sizes and types to balance any rotating part weighing from 1 oz. up to 50 tons. Literature will be sent on request.*

GISHOLT MACHINE COMPANY
1201 Washington Ave. • Madison, Wis.

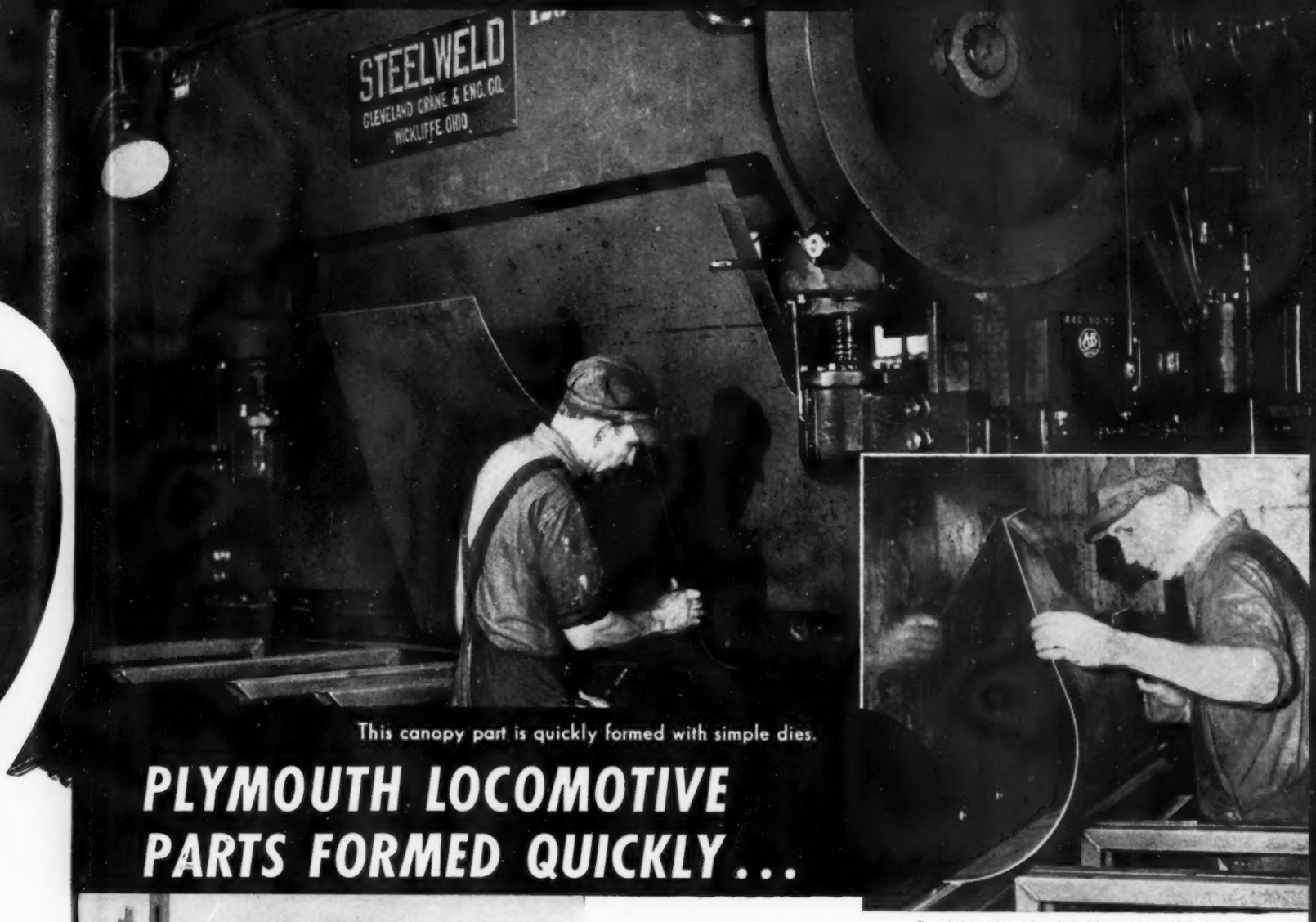
GISHOLT

The Army-Navy "E" has been awarded to Gisholt for highest service accomplishments in producing equipment vital to Victory.

ARMY E NAVY

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements

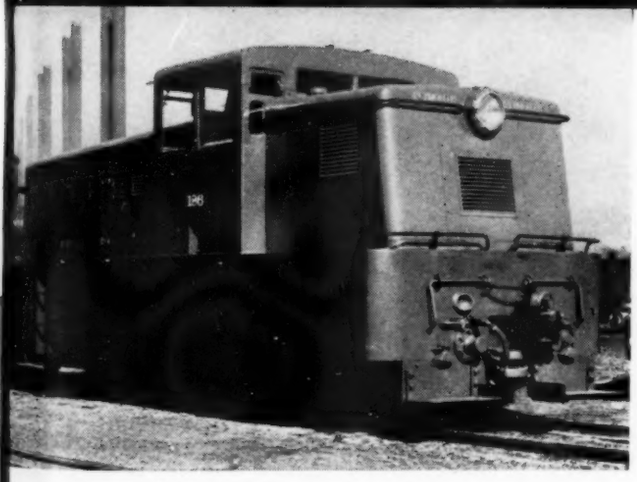
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES



This canopy part is quickly formed with simple dies.

PLYMOUTH LOCOMOTIVE PARTS FORMED QUICKLY...

Forming an exhaust housing with curvature of 8-inch radius.



All light metal hood and cab parts for this 65 ton Plymouth Flexomotive were formed on the press above

A Steelweld Bending Press has proven very advantageous in the forming of various metal parts required for the hood and cab of Plymouth Industrial Locomotives built by The Plymouth Locomotive Works, division of The Fate-Root-Heath Company, Plymouth, O. Since installed in 1936 the press has performed all such work required for the hundreds of locomotives produced.

Sharp bends or sweeping curves are easily and quickly formed by the operator who previously had no experience in press work. It is a simple matter for him to change dies and set up for the different work. The metal formed is for the most part of 12 gauge steel.

Although the press is in operation every day, in the many years it has been in service, it has required only the replacing of one small rubber belt for the automatic lubricator. Beyond that not one cent has been spent for repairs. The operator lubricates all grease fittings with the pressure gun once a week and checks on clutch and brake adjustment three times a year. Original brake and clutch linings are still in use.

The plant executives are highly pleased with the machine and declare it to be one of their most useful tools.

THE CLEVELAND CRANE & ENGINEERING CO.

STEELWELD MACHINERY DIVISION

1127 EAST 283RD STREET • WICKLIFFE, OHIO.

MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEELWELD BENDING PRESSES

GET THIS BOOK!

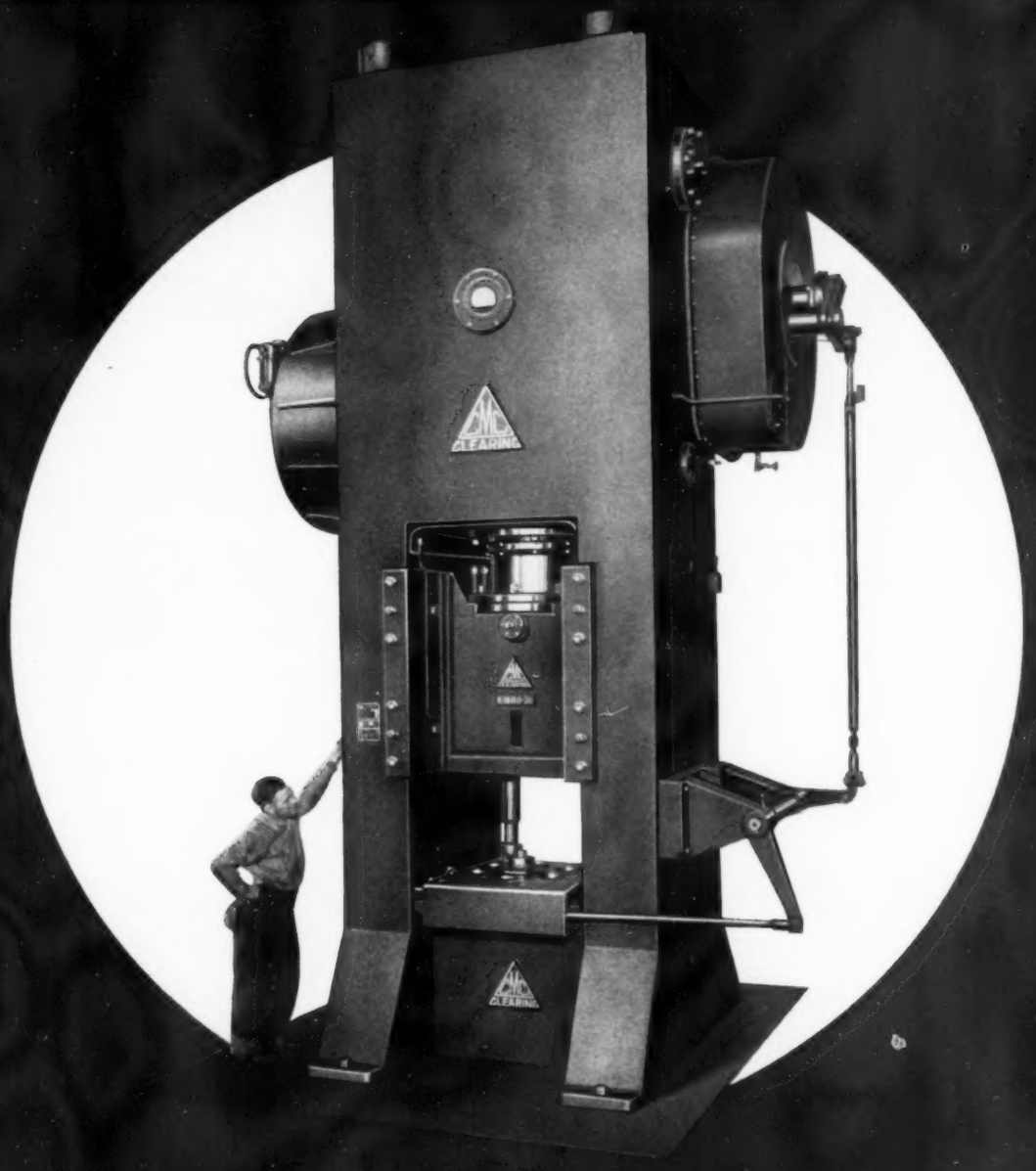
CATALOG No. 2002 gives complete construction and engineering details. Mail request for free copy on your company letterhead.

STEELWELD

BENDING PRESSES

GENERAL SALES AGENTS: CYRIL BATH & CO., E. 70TH & MACHINERY AVE., CLEVELAND

STANDARD
Dial Bore Gages
"CONVOY
YOUR PARTS
THRU
PRODUCTION"
STANDARD GAGE CO., INC.
POUGHKEEPSIE, NEW YORK



MECHANICAL AND HYDRAULIC PRESSES

CLEARING

MACHINE CORPORATION

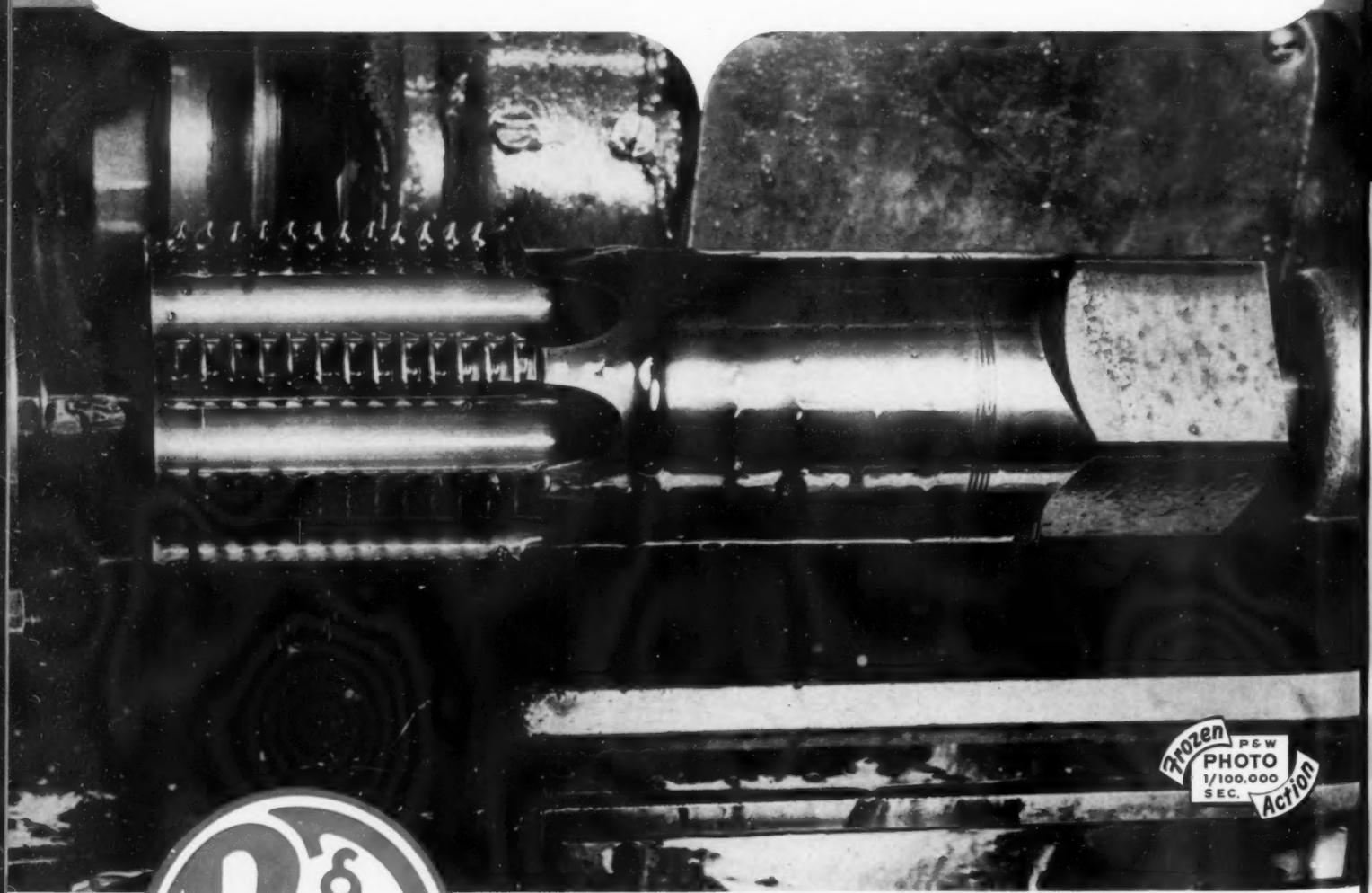
CHICAGO

Give 'em the works
ALL DAY, ALL NIGHT

Yes, that tap is as big as it looks . . . big enough to cut the clean, strong, accurate threads that stitch America's heavy war machines together . . . big enough to make Adolf wish he'd stuck to paperhanging.

That's a P&W tap . . . one of the thousands daily going into 168-hour-week service in war production. It will turn out *plenty* of jobs, take a terrific beating before it's ready for the scrap pile. *So will your smaller P&W taps, dies, reamers, cutters. So will your P&W machine tools, and your P&W gages.*

This war has opened the eyes of many American metalworkers to the unexpected heights of stamina, staying power, *guts* of P&W equipment. Remember this lesson . . . apply it in your own work; *don't spare the pressure . . . your P&W tools can take it.*



P&W Photo — Unretouched.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

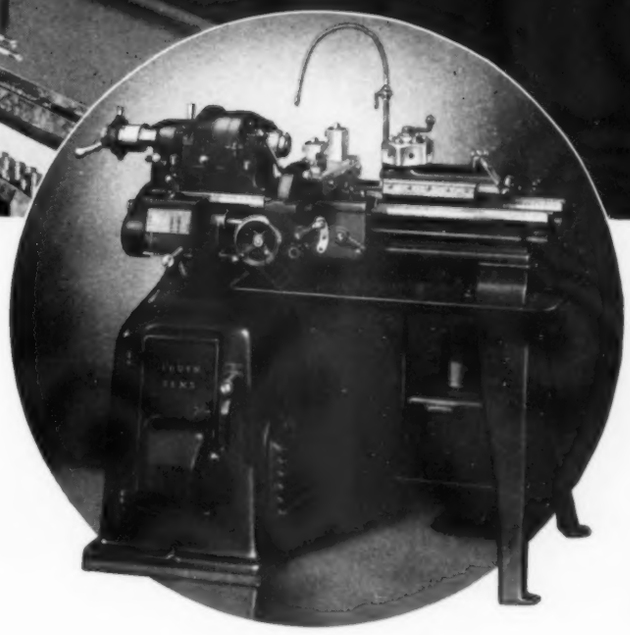
WEST HARTFORD • CONNECTICUT

RAPID MACHINING

with *Precision*

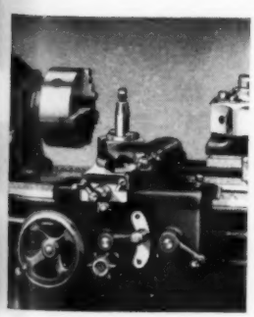
on South Bend Series 1000

TURRET LATHES



RAPID machining *with precision* is easily accomplished in shops that are equipped with the new South Bend Series 1000 Turret Lathes. Designed for manufacturing small accurate parts, they have the stamina to maintain exact tolerances on volume production without sacrificing speed or versatility.

These Turret Lathes are especially suitable for second operation work. The basic South Bend features that insure efficient production are supplemented by the handlever operation of the turret, cross slide, and collet attachment to speed up machine operation and lessen operator fatigue.

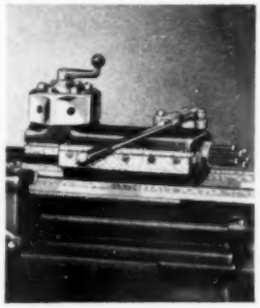


★

UNIVERSAL CARRIAGE

Provides wide variety of feeds for efficient production work — 48 power longitudinal feeds — 48 power cross feeds — 48 precision thread cutting feeds, 4 to 224 per inch.

★



★

HANDLEVER TURRET

Permits rapid positioning of turret tools. Turret indexes automatically on the return stroke. Equipped with adjustable stop for travel of each of the six tool positions.

★

SPECIFICATIONS

Hole through spindle	1⅜"
Collet capacity, round	1"
Swing over bed and saddle wings	10⅛"
Spindle speeds, (twelve)	50 to 1357 r. p. m.
Effective feed of turret slide	4"
Thread cutting range, (48 threads)	4 to 224 per inch

ARMY E NAVY

TRADE MARK SOUTH BEND LATHES

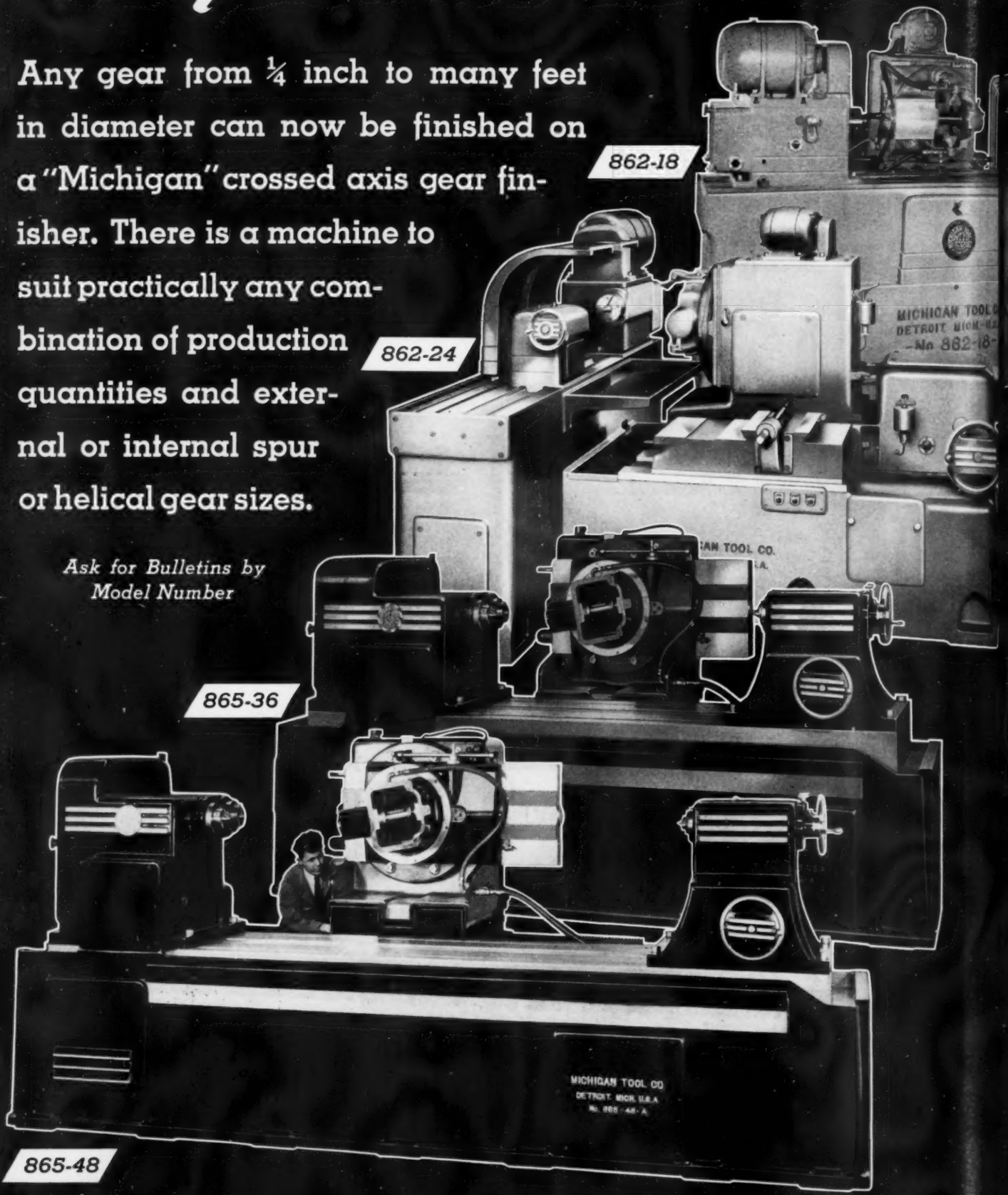
SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA — LATHE BUILDERS FOR 36 YEARS

No gear too large..... No gear too small...

Any gear from ¼ inch to many feet in diameter can now be finished on a "Michigan" crossed axis gear finisher. There is a machine to suit practically any combination of production quantities and external or internal spur or helical gear sizes.

Ask for Bulletins by Model Number



MACHINE MODEL NO.	GEAR CAPACITY (diameter)
861-4B (Light Duty)	¼" to 4"
900 (Rack Type)	1" to 8"
860-(A or B)-8	1" to 8"
860-(A or B)-12	1" to 12"
860-(A or B)-16	1" to 16"
862-18 (Heavy Duty)	2¼" to 18"
862-24 (Heavy Duty)	2¼" to 24"
865-36 (Heavy Duty)	4" to 36"
865-48 (Heavy Duty)	4" to 48"
865-??? (Heavy Duty)	for larger gear sizes up to 16 feet diameter (on special order)

MICHIGAN TOOL COMPANY

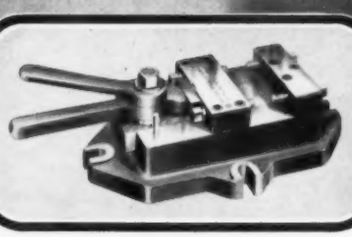
7171 E. McNichols Road Detroit, U.S.A.

Special Machinery by FENN

For years the name Fenn has been tied to the design and building of Special Machinery. But war has changed all this. For the duration, all blue prints and plans for this type of work have been put on the shelf.

Geared to the war production program, Fenn is turning out quantities of parts and equipment for planes, tanks, guns, and ships. Day and night our men and machines are producing machinery, equipment. tools, and anti-aircraft gun and plane parts.

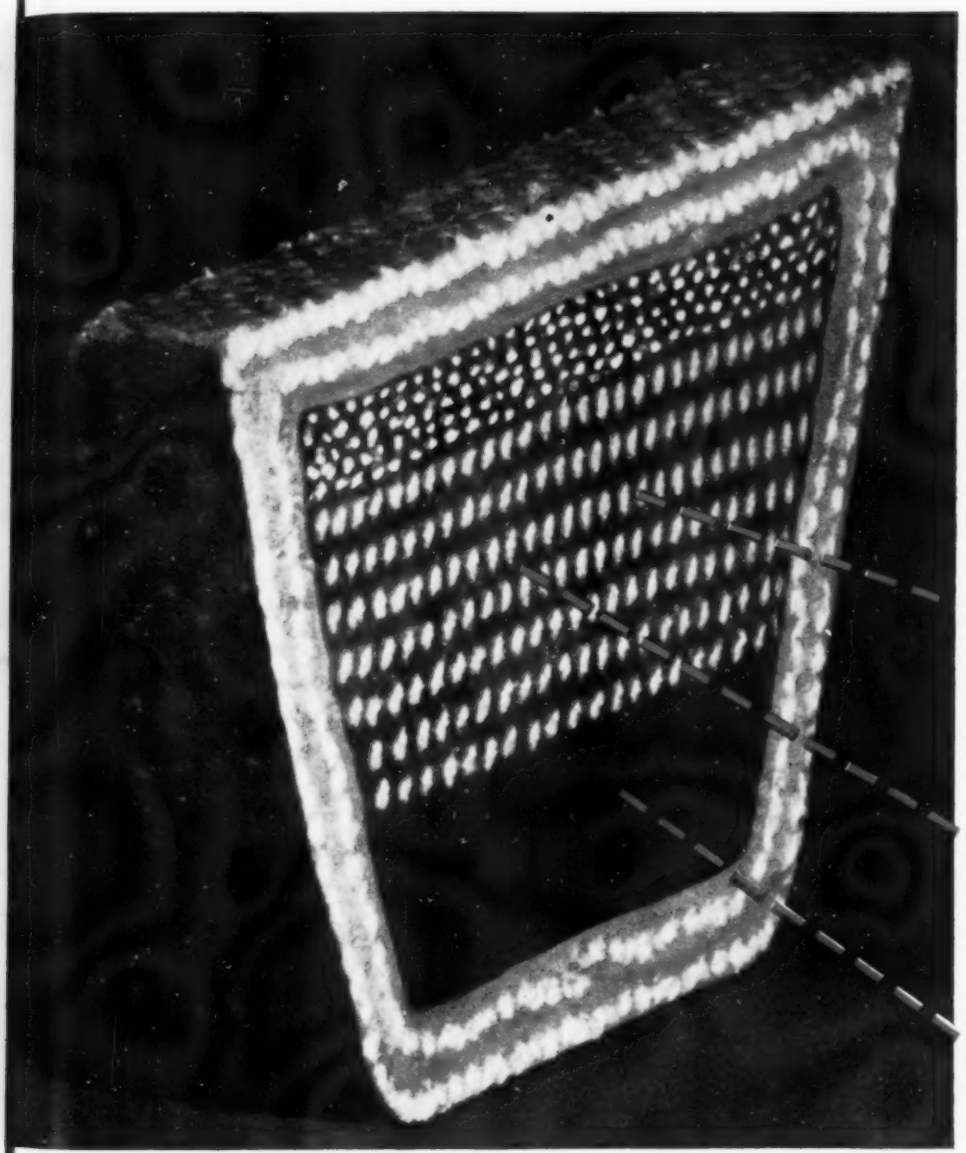
But when men return to peaceful pursuits, once again it will be - - *Special Machinery by Fenn.*



The Fenn Manufacturing Co.

HARTFORD, CONNECTICUT - - ESTABLISHED 1900

Here's a Slice of LONGER V-BELT Life!



It's the section of a new Texrope Super-7 . . . and the new ways Longer Life is Built right into it Point to ways *You* can make Your V-belts last Longer.. whatever Brand you Use!

V-Day needs every V-Belt

50% STRONGER CORDS produced by the new Flexon process combat stretching. **YOU** can fight stretching—and the slip and burning that result — by promptly taking up any slack that may develop. Remember, many V-belts are now working four times as many hours a week as in peacetime, may need inspection *four times as often!*

★

20% MORE CORDS than before help protect the new Texrope Super-7 against strains and breaks. **YOU** can minimize breaks in your plant — whatever make of V-belts you use — by requiring that V-belts *never* be pried into grooves. For V-belts, prying is a back-breaking operation!

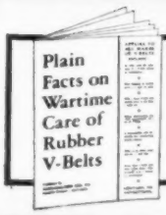
★

COOLER-RUNNING CUSHION of special rubber "eases" cords around sheaves—for smoother flexing and less heat. **YOU** can fight heat by preventing misalignment. It causes rubbing of belt sides, extra heat and shorter V-belt life. So keep sheave grooves in line—shafts parallel.

★

WHEN YOU DO NEED new V-belts, *invest in the best* — Texrope Super-7!

A 1543



FREE! Every engineer should have this valuable new handbook in his technical library.

It applies to *all* makes of V-Belts—contains no advertising. Write Allis-Chalmers for it *now!*

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

TEXROPE* SUPER-7 V-BELTS

*Trade mark registered U.S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. Available in all sizes.....½ h.p. to 2,000 h.p.

CLEVELAND *Single Spindle* AUTOMATICS CUT COSTS 28%, SAVE 30% TIME, ON GEAR BLANKS FOR KEARNEY & TRECKER CORPORATION

● Here is a typical example of Cleveland *Single Spindle* Automatic performance in the plant of one of America's most famous machine tool builders—Kearney & Trecker Corporation. Typical, of course, because machine tool builders are especially exacting and particular in seeing to it that the machine tools they use live up to their basic purchase consideration—amortization of their cost within a reasonable, given time limit.

This primary feed shaft drive gear blank is cut from S.A.E. 4615 bar stock of 4¾-inch O.D., finished part weighing 3 lbs. after removal of 4 lbs. of metal in the operation. Turret and cross slide tool sequence of operation is: feed to gauge, spot, drill and turn, form, bore, ream and cut off. Close tolerances are easily held. Quantity consists of 110 pieces. Says the Foreman, "Performance of machine is perfect."

These 5¾-inch Cleveland Model A machines are recent additions to a large battery of Clevelands in this well-known plant. Model A in 3¾-inch to 8-inch sizes has 4-speed motor drive, universal camming and variable tool feed; in 1 1/16-inch to 2½-inch size, constant speed drive is standard, 2-speed drive optional at slight extra cost. Ask for detailed Bulletins of sizes of interest to you.

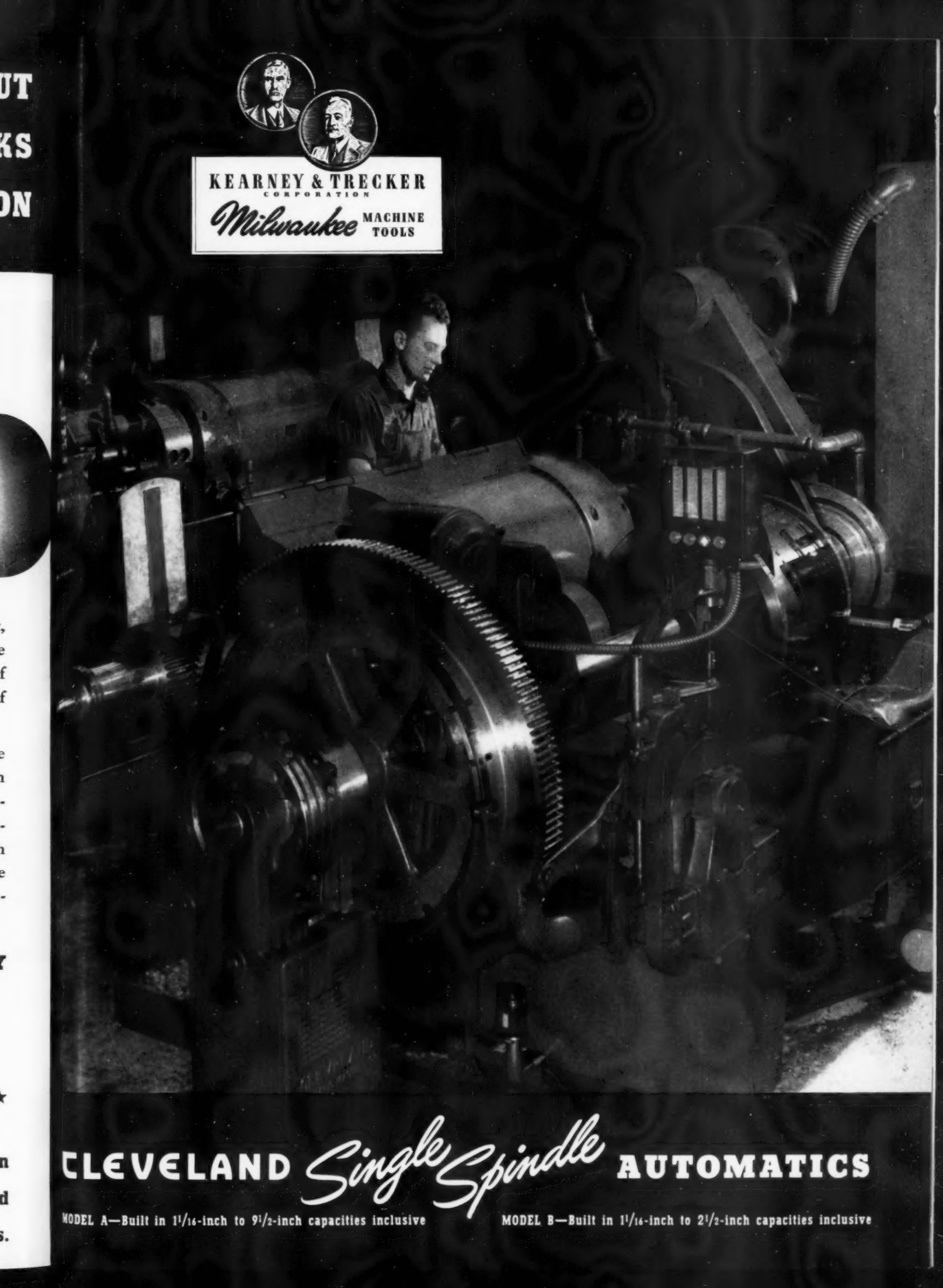
THE CLEVELAND AUTOMATIC MACHINE COMPANY

2269 ASHLAND ROAD • CLEVELAND, OHIO

Sales Offices: CHICAGO: 565 W. Washington Street • DETROIT: 540 New Center Building
NEWARK: 702 American Insurance Building • CINCINNATI: 507 American Building

★ ★ ★ ★ ★ ★ ★

Consider **Cleveland *Single Spindle* Automatics if you make duplicate parts in small quantities. By using *single spindle* automatics the increased production obtained from them may release a number of other critical machine tools for other purposes.**


KEARNEY & TRECKER
CORPORATION
Milwaukee MACHINE TOOLS
CLEVELAND Single Spindle AUTOMATICS
MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive
MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusive

Tune in on

T-04 *

FIRTHITE

Universal grade for heavy duty, interrupted cuts, and coarse feeds, on older machines.

TA *

FIRTHITE

General-purpose grade for cutting steels under "average" conditions.

T-16 *

FIRTHITE

The grade for fine, extremely fast machining of steel.

T-O-O-L S-T-E-E-L

High-grade tool steels including Circle "C," Blue Chip, Star-Mo, Firth-Sterling Special, etc.

FIRTHITE

SINTERED CARBIDES

for Complete Shop Tooling

T-31*

Hardest, wear-resistant, premium grade for precision boring, etc.

HC

For coarse feeds on soft materials at slow speeds, skiving brass, grooving aluminum alloys.

H

Most dependable grade for general use in roughing softer materials.

HA

Best grade for finishing hard, abrasive irons, non-ferrous and non-metallic materials.

FIRTHITE

MODERN MATERIALS
FOR COMPLETE SHOP TOOLING

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT

* Made under one or more of the following patents on TITANIUM Carbides: 2,246,387; 2,265,010; Re 22,073; Re 22,166.

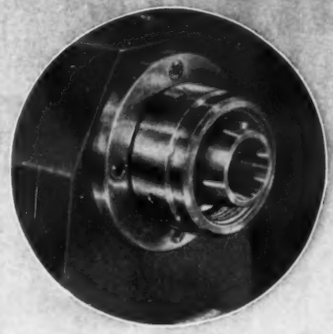
RIVETT

715 PLAIN BENCH LATHE

Power and Speed Range Are Combined with Precision for Greater Earning Capacity

715 PLAIN BENCH LATHE

Replaceable Spindle Belts



Long Taper Key-Drive Nose

Convenient Drive Control

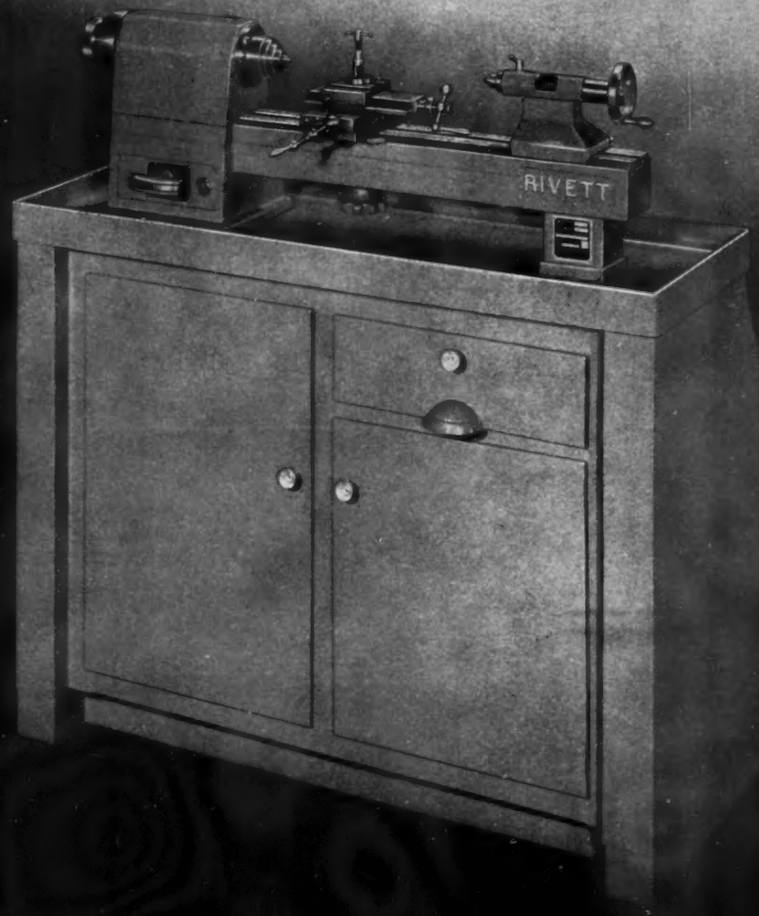
The Rivett No. 715 Bench Lathe fulfills two distinct functions: the production of small duplicate parts requiring extreme accuracy, and the finishing and fitting of fine elements in assembly, maintenance, tool room and laboratory. Various attachments extend its usefulness, and each employs the inherent truth of the preloaded ball bearing spindle. The attachments include, besides compound slide rest and tailstock, a universal grinding attachment and milling attachment. The [illegible] drive provides eight selective spindle speeds and may be [illegible] with either steel cabinet or bench mounting.

The original accuracy built into the No. 715 is protected for years of normal use. The enclosed headstock provides rigid, vibrationless mounting for the super-precision ball bearings. All revolving parts are dynamically balanced. The self-centering design of the long taper key-drive spindle nose guarantees true running chucks and face plates. Steel top slide and full depth Acme feed screws make for an enduring compound slide rest. All vee belts are replaceable without disturbing lathe or drive assembly or removing spindle from its bearings.

SPECIFICATIONS

Swing over bed, dia.	7"
Distance between centers	15"
Collet capacity, max. dia.	¾"
Step chuck capacity, max. dia.	5"
Jaw chuck capacity, max. dia.	4"
Spindle capacity, max. dia.	55/64"
Slide rest, travel of tool post slide	4¼"
Slide rest, travel of cross slide	5"
Tailstock spindle travel	3"
Spindle speeds: Eight forward and reverse	150 to 3500 r.p.m.
Weight of lathe, mounting and drive, net	650 lbs.

For Further Description
Write for Bulletin 715

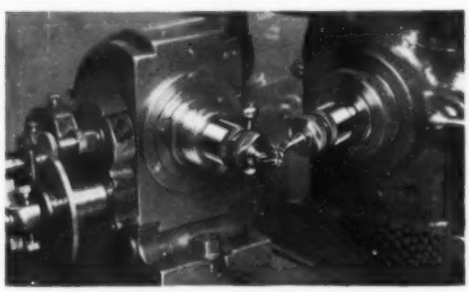


RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

NEW....

Thompson SPRING COLLET Adapter

Illustration shows the spring collet adapter as applied to vertical milling machine — takes standard collets — can be used in any machine having a taper spindle.



Double application of spring collet adapter on milling machine — eliminates heavy bulky chucks — free access to work and cutter — note closeness of cutter in proximity to work.

The Thompson Spring Collet Adapter is *new* in design — efficient in action. Consisting of only two parts it fits all standard spring collets — grips tight, no slipping — accurate. Made for all taper spindle machines, it eliminates heavy, bulky chucks — gets closer to work — time saving, economical.

Give your mechanic a better adapter — specify "Thompson".

Write for literature and prices of special adapters.

TRADE MARK Thompson REG U.S.PAT OFF

AUTO-ORDNANCE Corporation

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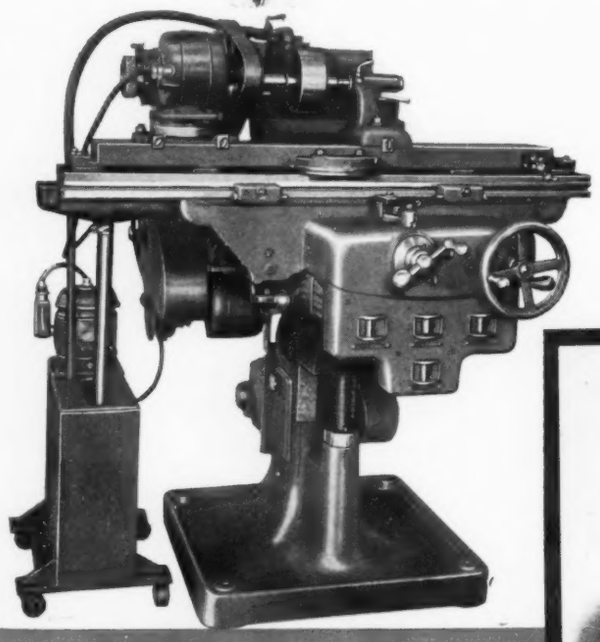
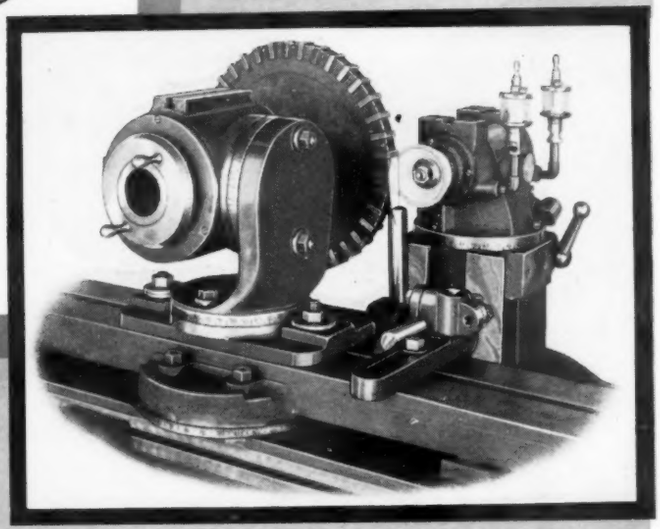
give 'em the best of care!

Yes, sir! Today your tools and cutters are far more precious than jewels and that's why they deserve special Covel "91-A" Care!





This Covel No. 91-A Universal Cutter and Tool Grinder is "job insurance" for your high-priced and hard-to-replace tools. It prolongs tool and cutter life through proper precision sharpening — and saves hours of grinding time every day * * * Your cutters and tools are valuable only in relation to their accuracy and production life. Get the utmost in tool performance through fast precision grinding on a COVEL "91-A".

Here is the Covel Large Face Mill Grinding Attachment which quickly mounts on table of "91-A". Supports large variety of cutters, tools, etc., for accurate grinding. Has No. 7 Morse taper hole in spindle. Swivels 360° vertically and horizontally. A typical "Universal" feature of the "91-A".

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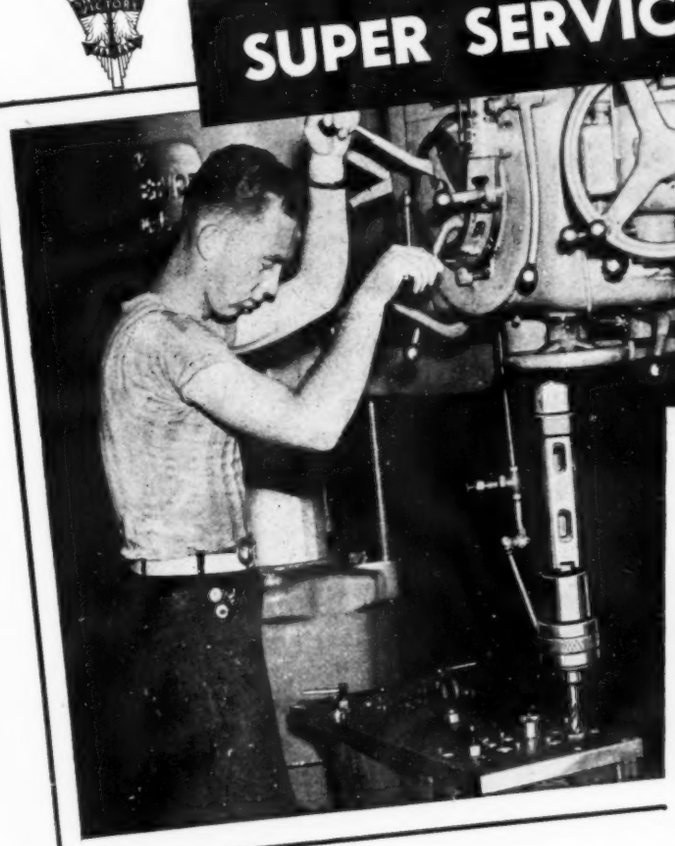
The Cincinnati Bickford

SUPER SERVICE RADIAL



..has what it takes to help BUILD SHIPS fast!

Marine engine output must keep pace with record-breaking shipbuilding . . and American plants engaged in marine engine production are more than fulfilling their contracts. Vitally important in this production program are the numerous Super Service Radials now engaged in shipbuilding and kindred operations, of which a good example is illustrated in the above photograph. The job shown, as performed in a prominent eastern plant, calls for drilling a number of holes to exact locations in high pressure blade rings for Marine Turbines. Although production figures cannot be published, it is obvious that the Super Service Radial has what it takes to help maintain the record-breaking pace in American shipbuilding practice.

ARMY E NAVY

AWARDED SEPT. 10, 1942

Full details concerning the advantages of Super Service Radials will be sent upon request

SUPER C.B SERVICE

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

Ideas for VICTORY from the Production Lines behind the Firing Lines . .

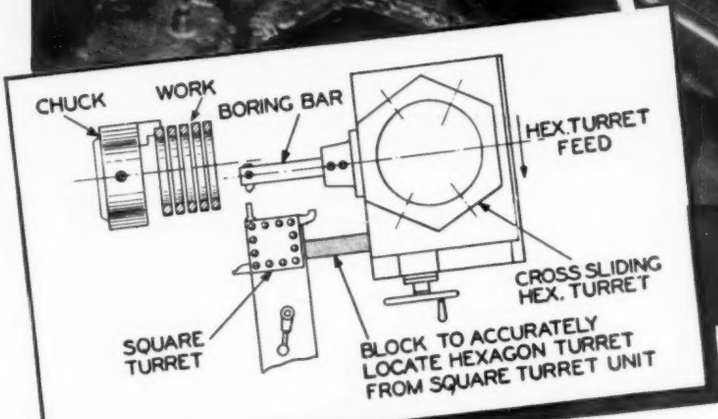
A Citation for Men in War Industry

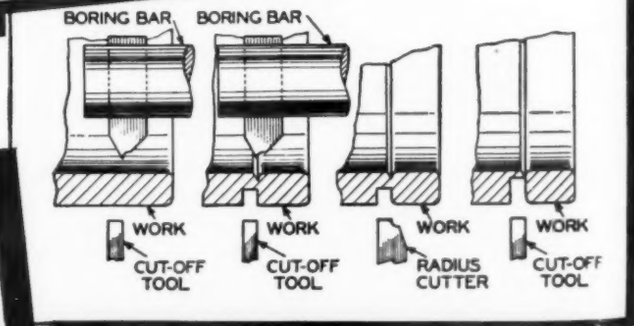
He Gets More Pieces Per Hour

• The idea of machining several bearing races from a long piece of tubing is not new to many operators but E. F. Toth, turret lathe operator for Bantam Bearing Corp., South Bend, Ind., has added a simple idea which enables him to complete a bearing race in one chucking.

On this job the radius form on the inner race must coincide accurately with the radius form on the outside of the same race. The drawings at right show how, after the machine is set up with the necessary cutters in the cross slide and cross sliding hex turret, a gauge spacer is used so the tools in the hex turret are at all times positioned accurately in relation with the cutters in the cross slide. We are glad to send a gold "Victory Pin" to operator Toth for his initiative.

In response to our request, hundreds of turret lathe operators have told us how their ideas and methods have saved time and materials. Gold Victory Pins have been sent to these operators in recognition of their resourcefulness and many of their ideas are published in a Warner & Swasey shop bulletin, Blue Chips. Make sure your operators are on our list to receive Blue Chips. It is sent free to the homes of over 38,000 turret lathe operators. Write Warner & Swasey, Cleveland, Ohio.





WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTER, FOR LESS...
WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

ABOUT FACE

Traditionally the Ordnance Department has designed and built military equipment with the highest possible precision, disregarding economy of time, materials or machinery. Major General L. H. Campbell, Jr., began fitting shell production to modern competitive methods when, as a colonel, he commanded the Artillery Ammunition Division, Frankford Arsenal. Today, as Chief of Ordnance, he is extending this idea to all types of ordnance. John Haydock tells how "The Army Turns to Trifles," and finds that they add up to big savings. Page 1277.

JOHN SASSO

PLASTICS PRIMER

Plastics are being substituted for various metals by many firms which have had little previous experience with them. John Sasso answers many of the questions on the proper method for machining and finishing these new materials. Page 1283.

MAJOR LOCOMOTIVE REPAIRS

Repeated fractures occurred in the frames of locomotives pulling heavy loads through the Berkshires. The difficulty has been eliminated by removing the frame ahead of the front pedestal jaws and replacing it with new and wider sections. The frames are flame cut to remove the old section, and then the new frame section is welded in. Page 1288.

DEXTERITY TESTS FOR WOMEN

It is being repeatedly demonstrated in industry today that women can, if necessary, do most of the operations traditionally performed by men. Naturally, individual women are better adapted for some operations than for others. A series of dexterity tests is used by the Republic Aviation Corporation to determine the ability of women to operate machines, to use hand tools, and assemble small parts. Page 1280.

KAISER DID IT

No phase of war production has attracted more widespread popular interest than the application of assembly line methods to ship production. At the Richmond, Calif., yards operated by Henry J. Kaiser, the midship deck house and the after deck house for Liberty ships are built on giant conveyor lines. The operation of these lines is described in the Armament Section, "How Kaiser Builds Liberty Ships." Page 1299.

HOLES FOR SLOTS

When rectangular slots are made by drilling holes adjacent to each other, much time spent in chipping and filing can be eliminated by drilling the holes close together. A practical method for doing this, using an old roller bearing, is described in the current series of "Shortcuts for the Small Shop." Page 1282.

CONTROLLED ATMOSPHERES

Proper application of controlled atmospheres in heat-treating will result in uniformity of the product and make possible close control of the quality. C. E. Peck, heating engineer, Westinghouse Electric & Manufacturing Company, in a series of tables gives the applications, cost, and types of controlled atmospheres. Page 1315.

C. E. PECK

BERNHARDT SCHLENZIG

LOW-COST AIRCRAFT DIES

Many of the sheet-metal parts used in airplane construction can be produced with forming and bending dies made of plastic and semi-plastic materials. Bernhardt Schlenzig, describes the use of these low-cost dies at the Naval Aircraft Factory. Page 1307.

JUMPED TO 40

Brake cross shaft levers which were formerly milled two at a time are now milled 40 at a time with the use of a fixture developed by Carlton Jones and submitted as a War Production Drive suggestion to his company, the Yellow Truck & Coach Mfg. Company. This is one of a number of war-winning suggestions described in this issue. Page 1292.

DOWELS AND DIES

In his second article on the maintenance of press tools, H. R. Hageman discusses the selection and use of dowel pins and pilots. Page 1286.

COMING

Nearly 80 percent of the production workers in a new plant operated by Westinghouse are graduated from special training courses. In an early issue F. D. Newbury, vice-president, and P. N. Love, supervisor of industrial relations, Canton Ordnance Division, Westinghouse Electric and Manufacturing Company, will tell about the training system that made this high showing possible.

MORRIS MOR-SPEED Radial

brings speed and versatility to war production jobs

This is typical of the many varied applications of Morris Radials to all out war production. This unique installation shows a Morris Radial performing drilling, tapping, boring and facing operations from a single set-up and resulted in a saving of 50% handling—25% machining time.

No matter what your operations are, you will find Morris Mor-Speed Balanced Arm and Head Design—Centralized Control—Smoother Power—Ample Speeds and Feeds will help you to speed up production and cut costs on radial work. Write for Bulletin.

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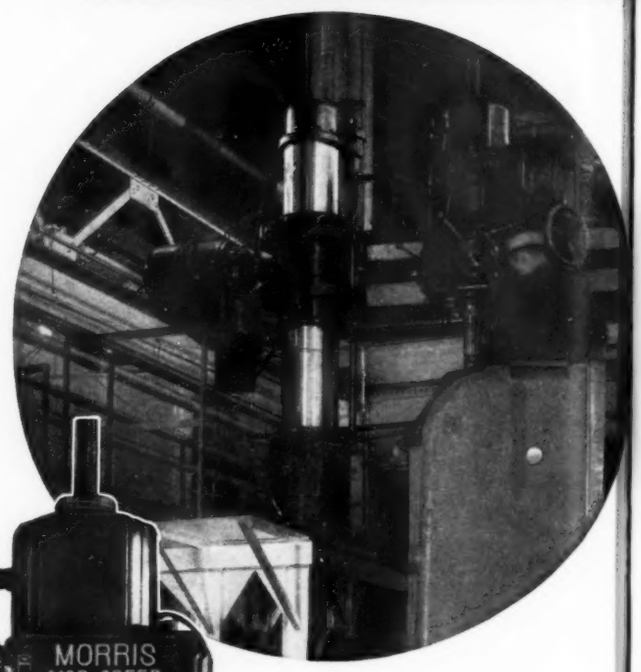

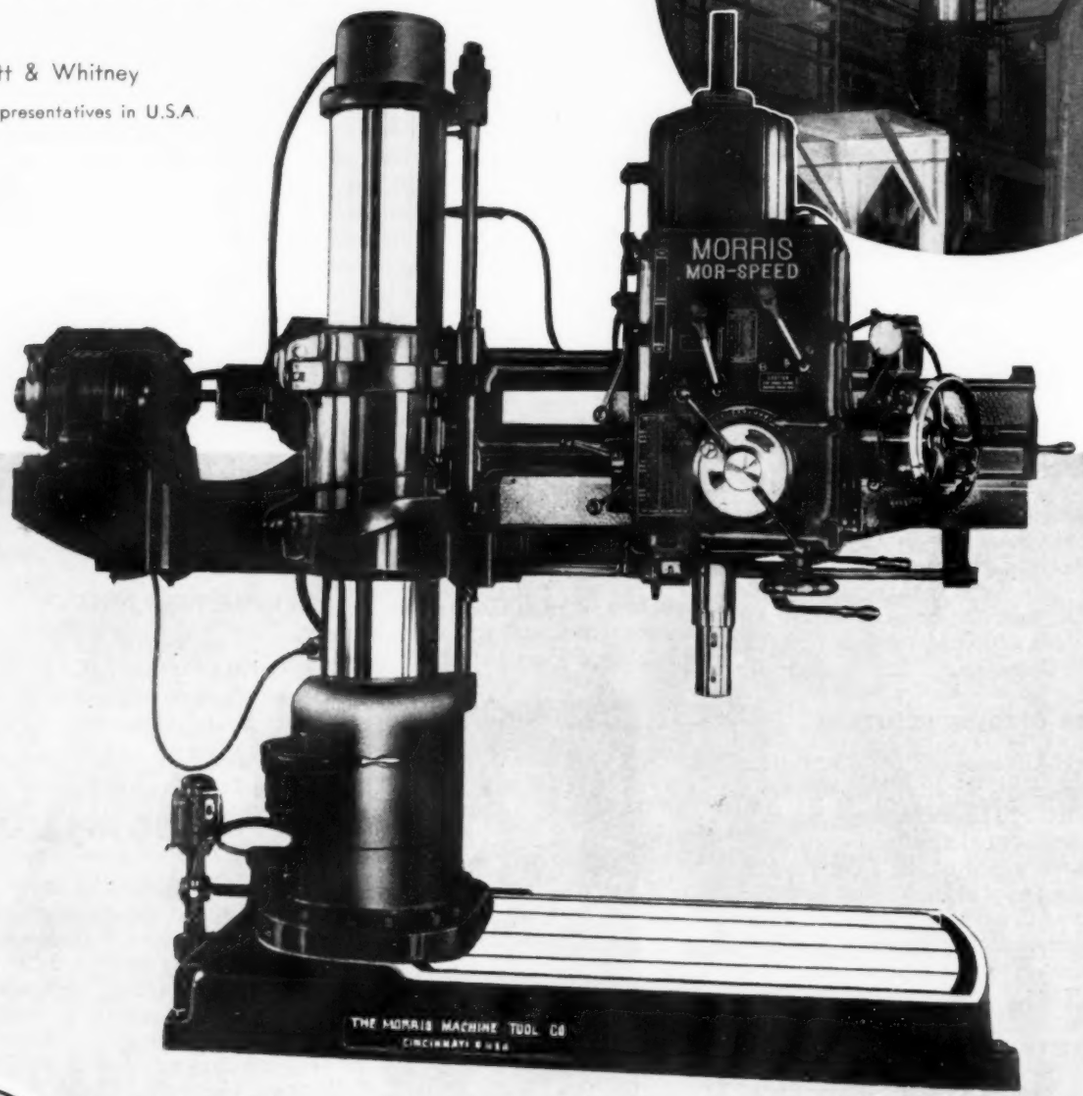

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.
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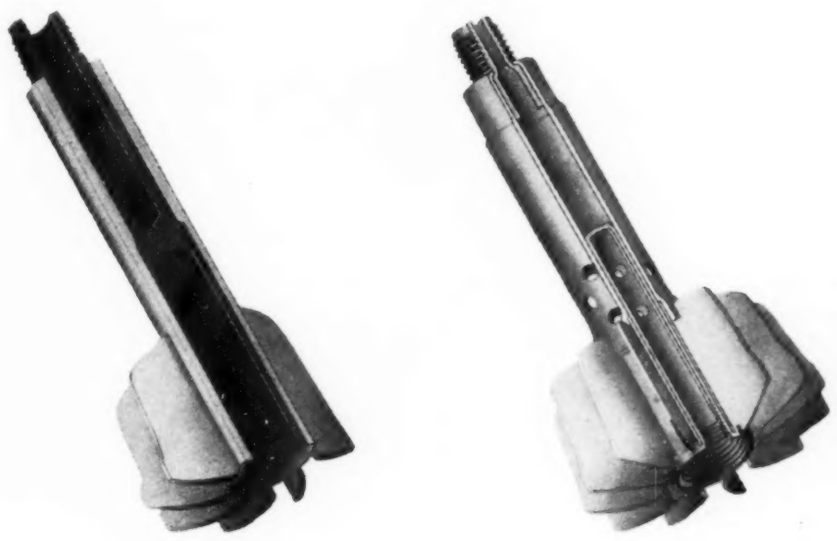


★ A mortar shell tail fin, shown above, was formerly made with a core turned from steel bar stock core on which aluminum fins were die-cast. According to suggestions received by the Ordnance Department this part was entirely redesigned and made of steel stampings. The body of the shell now consists essentially of three drawn steel cups which are fitted together. The fins are steel stampings which nest together around the periphery at one end and are held in place by the crimped end of one of the cups. Spot welding ties the assembly into one rigid unit. As a result 400 lb. of aluminum are saved per thousand assemblies and the machining time is substantially reduced

The Army Turns to Trifles

BY JOHN HAYDOCK, MANAGING EDITOR, AMERICAN MACHINIST

General Campbell scrapped the "hands off" policy on ordnance design to invite the ideas of all war workers on short cuts

A FEW YEARS AGO an ordnance officer, defending the construction of a certain gun, explained "When we design a piece of ordnance we are not interested in economy. We make it the very best we know how for conditions we anticipate and for those we cannot predict. For a battle may turn on the failure of a small part that silences a big gun."

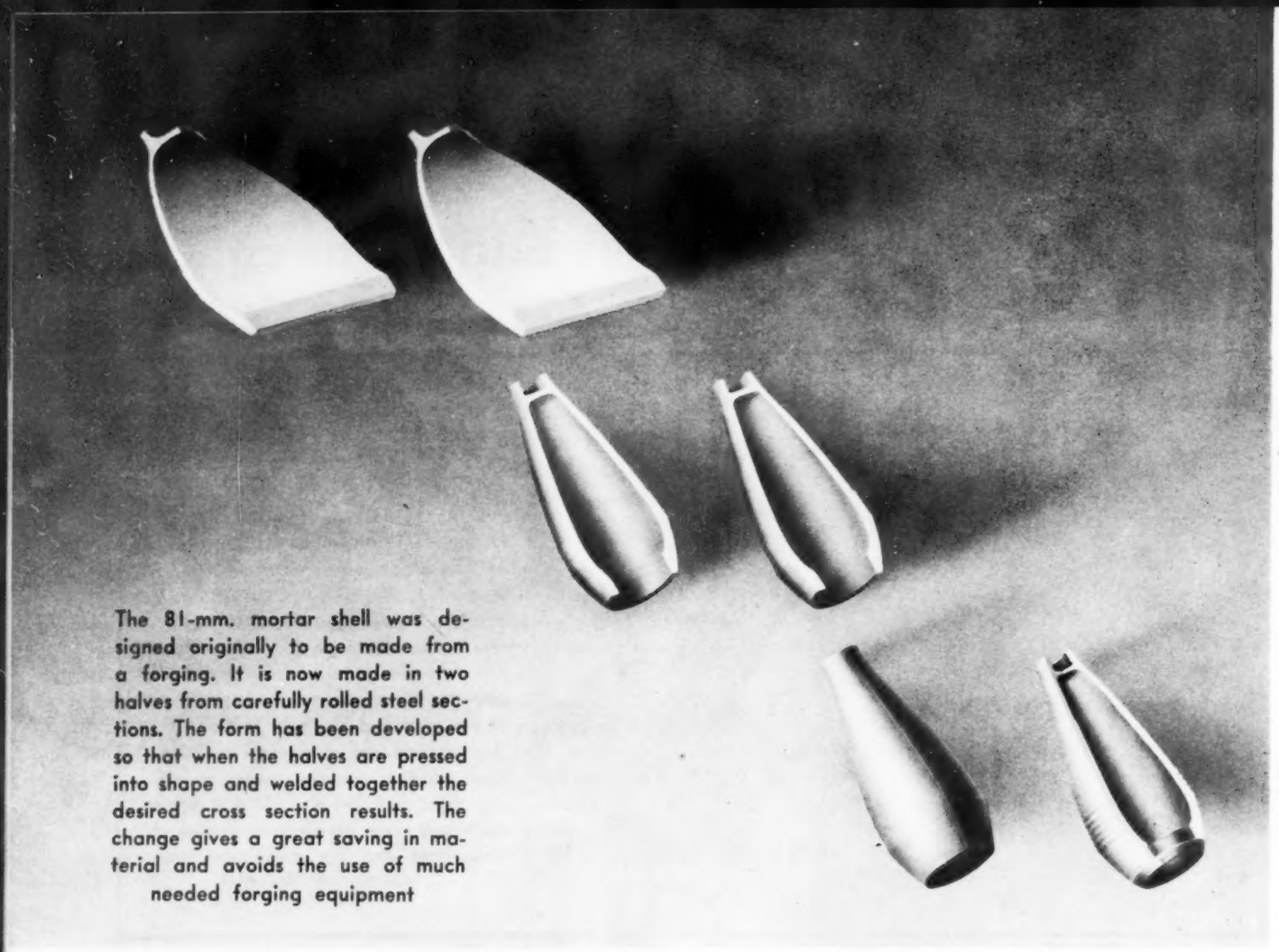
This line of thinking prevailed when Army equipment was made in small lots and when time and materials were plentiful. But it led ordnance designers up some strange alleys which saw the light of day only when munitions manufacture got into the hands of men accustomed to think along competitive lines.

"We are making guns" said the manager of one contracting plant, "and we are making them the way the Army wants. But if we could redesign them to meet our manufacturing methods we could turn out twice as many in the same number of man-hours. And they would work just as well."

Why didn't he get up on his hind legs and tell it to the Army? Well he had tried that again and again until he concluded that he was butting his head against a stone wall. He was told that guns were a different breed of cat, that they could not be turned out like refrigerators, that they worked at high speed under enormous instantaneous pressures and under conditions of mud and water that the layman could not even imagine. So the Army wanted them that way.

"Sometimes they would soften up a bit," said the plant manager. "In six months we got a flash shield that fitted nothing but God's thin air, changed to a sheet-metal stamping. Meanwhile we hogged it out of a drop forging, three-quarters of which was carried out to the chip bin. It came to a point where we asked for changes only in the most obvious cases."

There is no doubt that ordnance engineers in those days were as tough as top sergeants when it came to altering designs. Guns and gun carriages, shell and fuzes had been brought to a point of satisfactory performance as proved



The 81-mm. mortar shell was designed originally to be made from a forging. It is now made in two halves from carefully rolled steel sections. The form has been developed so that when the halves are pressed into shape and welded together the desired cross section results. The change gives a great saving in material and avoids the use of much needed forging equipment

by careful test and years of service experience. These products would work dependably, so why add new uncertainties because some baby-carriage maker bit off more than he could chew in undertaking an Army contract. Besides ordnance engineers were busy designing new weapons, anti-aircraft guns with longer range, mobile carriages to get there first, tanks with increased fire power and other products badly needed to meet Axis competition.

Deadlock Broken

Fortunately for the United Nations and their prospects of winning the war, the deadlock between the standpat ordnance designers and the new contractors who did not like their designs has been broken. The man who brought about the change is Major General L. H. Campbell, Jr., chief of ordnance, U. S. Army.

In 1939, General Campbell, then a colonel, commanded the Artillery Ammunition Division, Frankford Arsenal. At a time when most of the nation was dimly aware of the need to rearm, he saw the necesstiy of reorganizing his command in line with modern concepts of manufacture. He called upon machine tool builders who had lent their talents to private industry in competitive products and upon civil employees who had come up through the arsenal's apprenticeship school. The result was a model manufacturing line that turned out shell at a faster rate and at a cost unbelievably low.

General Campbell remembered the contributions to his pet project by the men down the line: tool designers, supervisors and machine operators. Their suggestions helped iron out the details that made the Frankford shell line so successful.

The plan which the General has now put into effect utilizes the talents of such men not only in the arsenals but in every plant working on Army products.

There are some 600 ordnance items of issue, consisting of complete guns, rounds of ammunition or other end products. Each item is made up of numerous subassemblies and each of these in turn consists of scores of small parts. It would have been a slow and painstaking task to re-examine all of these components with an eye to simplified design and ease of manufacture. Better by far to call upon the men now making these parts, invite their ideas and act on them promptly.

This is exactly what General Campbell did. He had drawn up a booklet "Tremendous Trifles" containing design changes that had saved time and material in the war effort.

Specific examples were quoted: How changing a suspension lug from forged steel to pressed steel saved 17,000 lb. of metal and 8,000 machine-hours in a lot of 100,000; how steel instead of brass in 105-mm. cartridge cases saved 12,600 tons of brass in a single order; how a one-piece dashpot piston machined from bar stock was replaced by two pieces, hydrogen brazed together, to save 1,000 lb. of steel and 60 percent of the machining time in each day's production; and many others.

Suggestions Invited

This booklet was sent to 6,000 prime contractors on ordnance products with a letter over General Campbell's signature asking for similar ideas from them and their employees.

Suggestions were invited under seven headings to:

1. Improve quality and dependability
2. Increase production
3. Save critical materials
4. Eliminate unnecessary waste
5. Eliminate need for critical machine tools

A fuze adapter made from bar stock has been revised in accordance with suggestions and is now made from stampings. Saving consists of 56 percent of the material used together with the release of automatic screw machines. Both time and labor are thus made available for other jobs

6. Reduce machinery required and release it for other war work

7. Reduce man-hours to release labor

Next the General set up a Conversion Unit within the Ordnance Department. This unit is manned by designers and tool engineers recruited from industry, men with a firm background of practical shop experience. They are entirely free from the duties of new ordnance design; their only job is the redesign of existing items for better production.

The results of the General's invitation have been prompt and effective. Industry instead of bowing resignedly to the *status quo* of ordnance design, has come through with a flood of suggestions a large percentage of which are usable and are being rapidly adopted.

The Ordnance Conversion Unit has sifted out these ideas and in some cases has put them into effect within a few hours. Others require investigation and perhaps proving ground tests, but in no case is action delayed.

A few samples of tangible results from suggestions already contributed are shown on these pages. A mortar shell tail fin, an 81-mm. mortar shell, a powder box handle, a fuze adapter and a bundling rod were all altered in design or material to effect marked savings. Hundreds of other practical ideas have been adopted or are now in the hands of Conversion Unit engineers.

And so the list grows daily from the ideas of men on war work in all parts of the country. Some of them hold high executive positions, others are operating machines. Some of the ideas deal with major changes in design, others at first sight appear to be trifling. But multiplied in terms of the thousands of parts that are needed to make complete guns and tanks and rounds of ammunition, the savings in materials, in man-hours and in machine time are staggering. No wonder the Army is interested in trifles; for it is trifles like these that will win the war.

Army Ordnance asks that suggestions be mailed to Major General T. J. Hayes, Office, Chief of Ordnance, Pentagon Building, Washington, D. C.

Redesign of a handle for a powder box clamping cover went through three stages. Originally it was made of navy brass. This was changed to a steel forging and then again redesigned to use a stamped steel handle with a nut made on a screw machine. The nut has two keys which are welded in place to keep it from rotating in the handle. The new handle saves 55 percent of the amount of material used and releases forging equipment for other war work

A bundling rod used in packaging propelling charges for guns of various calibers was designed originally as a carriage bolt with a thread cut on one end. It was found possible to reduce the size of the body of the bolt and to upset a small length of the end section for the thread. The thread was rolled in this enlarged section instead of being cut. This slight change saved approximately 23 percent of the amount of steel used and released thread-cutting equipment for other service. Cost was reduced and production speeded by the change

Dexterity Tests for Women Workers

Some women have more skill than others for jobs in war plants. These tests will evaluate their ability to assemble small parts, use hand tools and run machines

MANUAL TESTS are being used by the Republic Aviation Corporation to determine the mechanical aptitude of women applicants for training in aircraft work. They evaluate finger dexterity, tool manipulation and hand-eye coordination, and have been found extremely beneficial in classifying women for the type of training best suited to their abilities. The tests are also used in the plant for placement of the women after training.

The applicant is given four minutes to place two washers on 100 pins in this test, using the left hand for a plain washer and the right hand for a lockwasher. The number of washers applied within the time limit is a measure of finger and hand dexterity

Applicants who score high in the finger and hand dexterity test are singled out as being particularly suited for electrical and other small parts assembly. In this test, there are 105 pins driven into a plate set at an angle of 30 deg. The person being examined places two washers on each pin—a plain washer with the left hand and a lockwasher with the right hand. The applicant is permitted to practice this operation several times, using five pins at the top of the plate. She is then given four minutes to apply washers on the remaining 100 pins. According to this test, there is a wide difference between the speed with which various women can manipulate their fingers. Within the four-minute time limit, some applicants finish about 50 pegs, while others have filled the board.

A second test is used to determine how well an applicant can handle tools. It consists of removing twelve bolts from an upright piece of steel and reapplying them in a prearranged order in a second upright. The bolts are arranged in three rows of four bolts each. Wrenches are used on the top row of bolts, while a wrench and screwdriver are used on the other two. This test indicates relative aptitude for almost any kind of assembly work. Here again a variation in results have been obtained, with some applicants completing the operation in four minutes while others require fifteen minutes.

Republic, builder of the P-47 Thunderbolt fighter plane, has many of its women workers operating drill presses. A test has been devised to determine the hand-eye coordination needed to feed and operate these machine tools. The apparatus consists of a drilled plate and a lever-operated stylus. The applicant attempts to feed the stylus into holes without hitting the edges. She must use two hands simultaneously to operate the stylus and push the plate into position. Hits and misses are recorded by an electrically controlled counter. Some women complete this test in less than two minutes with only two or three errors. Others take as long as six minutes and make as many as 20 mistakes.

These tests augment standard examinations in tool identification, simple mathematics and similar subjects. A study of all test results are made, and

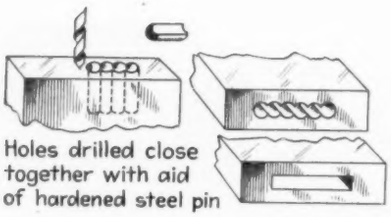
accepted applicants are trained in schools conducted under the auspices of the company. Instruction in the schools is under the guidance of mechanics and sheet-metal workers selected from the plant. Applicants accepted are under training for periods up to 16 weeks. Immediately upon completing the course, the mechanical aptitude tests herein described are repeated and results attained have a bearing on the job to which the trainee is assigned in the plant. Some are started as machine tool operators. Others are assigned to assembly operations on electric wiring and appurtenances, or jig assembly of plane structures.

The ability to handle tools is determined by this test. Twelve bolts are removed from one upright and reassembled in prearranged order on the other. Some applicants do this in four minutes while others require fifteen minutes

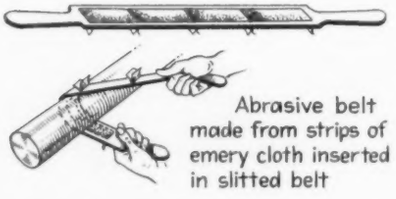
Ability to operate a drill press can be ascertained from this test. The degree of hand-eye coordination is established by inserting the stylus rapidly in the holes without hitting the edges. Some women can be complete the test in less than two minutes with only two or three misses

SHORT CUTS FOR THE SMALL SHOP

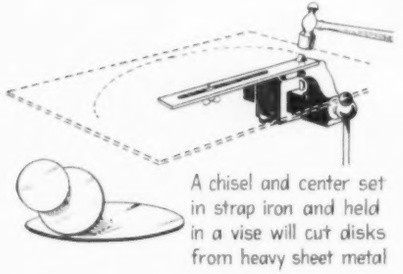
BY A. H. WAYCHOFF



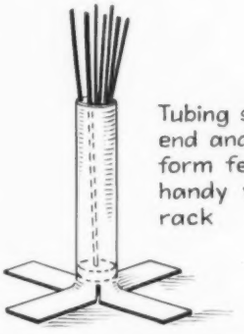
RECTANGULAR SLOTS are started by drilling holes adjacent to each other, but spaced sufficiently far apart to prevent the drill from breaking into the one previously drilled. This leaves considerable metal to be chipped and filed away to finish the slot. Much of this chipping and filing can be eliminated by drilling the holes close together with the aid of a hardened steel pin, ground flat or slightly concave. An old roller bearing will serve for this purpose. Drill the first hole. Insert the hardened and ground pin, and drill the second hole with the flutes of the drill against the pin. As the other holes are drilled, the pin is advanced to the hole previously finished.



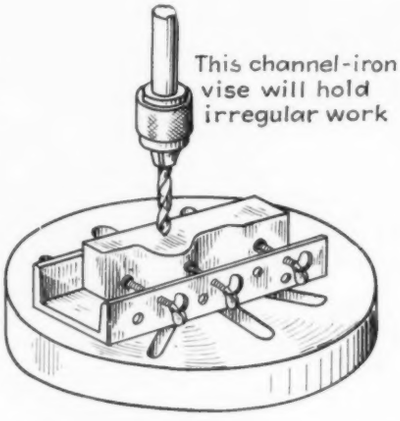
EMERY CLOTH HOLDERS, made from leather straps with strips of emery inserted as shown, are a convenience when cleaning or polishing shafts and pins. Take a piece of leather, slit it at about 9-in. intervals with a razor blade. Strips of emery cloth can be inserted readily in the slits. This leaves a continuous strip of abrasive on the face of the strap, which can be used with greater pressure and ease than a single strip of the emery.



CIRCULAR SHAPES can be cut quickly from heavy sheet metal with the aid of the illustrated device. The sharp center is adjustable in the piece of $\frac{1}{4}$x1$\frac{1}{2}$-in. strap iron, which is made long enough to accommodate the largest disk to be cut. The chisel is clamped in the vise and thereby prevented from turning while cutting the disks. The sheet to be cut is center punched, set on the sharp center and turned by hand while striking the stock directly over the chisel with a light hammer. The disks will be cut with an edge much smoother than if a hand hammer and cold chisel were used.

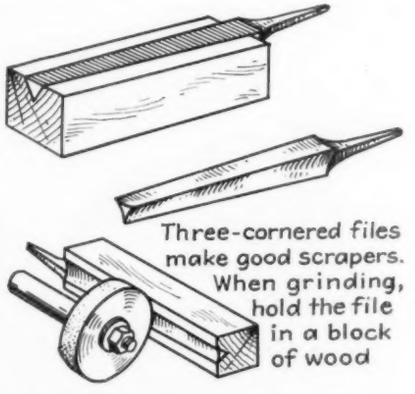


WELDING ROD RACKS that hold a generous supply of rods can be made from 2-in. tubing. Take a suitable length of the pipe and quarter one end with a saw for a length of 6 in. Then spread the quarters so they form a seat. A wooden or metal plug driven to the bottom of the tubing finishes the job.

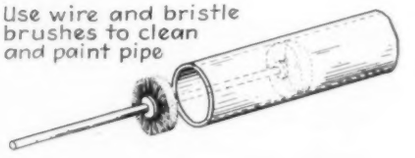


A VISE made from a section of channel iron and fitted with three or four clamp screws is an efficient device for the drill press. It is better than an adjustable-jaw vise for holding irregular shaped parts in which holes have to be drilled. It is a good idea to drill and tap a number of extra holes in the side of the channel in case an exceptionally irregular part has to be drilled. The clamps can then be set at the most suitable points on the piece.

SHAFT SCRAPERS save machinist's time and make his work easier. For this purpose, an old hand saw can be cut into 3-in. squares and notched by filing to fit over shafts of various diameters. The radii of the notches should be reasonably accurate. These scrapers will prove to be better than putty knifes or other flat-bladed scrapers.



HOLLOW-GROUND scrapers can be made from old three-cornered files. Take a piece of wood about the same length as the file and cut a triangular slot in it so that when the file is placed therein it will be flush with the top. The file, held in the block, can then be run back and forth across a grinding wheel. The face of the file will be hollow ground as shown. When the three faces have been ground, the file will serve adequately as a scraper.



RECLAIMED PIPE sometime have to be cleaned both inside and out. Scale and dirt can be removed from the inside with the aid of circular wire brushes bolted to small-diameter rods of suitable length. When it is necessary to paint the inside of pipe, circular brustle brushes can be used. Both the wire and bristle brushes are available commercially.

Are You Working With Plastics?

BY JOHN SASSO

Don't try to use tool shapes on plastics that you use for cast iron. They will cut but won't give long life or good finish

PLASTICS, after molding, are first subjected to rough finishing to remove flash from the parting line and from the openings in the molded pieces. Drilling and tapping operations follow, together with any other machining which may be necessary. Then a final buffing or polishing operation produces the desired finish.

Sprue marks on injection molded items often have to be removed by hand filing. This must be done carefully so as not to mar the finish on the molded article. The finishing operation is done by buffing with abrasive belts. These are particularly adaptable for medium and larger molded items. One of the recommended cloths for finishing has a silicon carbide abrasive grain bonded by synthetic resin. The abrasive belts are available with grits of No. 24 to 600 mesh size. Grades ranging from 220 to 230 mesh have been found most useful for rough finishing plastics and for the removal of sprue projections and heavy flash lines. Belts may be operated dry. Belt speeds should range from 2,000 to 3,000 ft. per min. When irregular surfaces must be finished, thin and narrow belts give best results.

Plastics are poor conductors of heat. Therefore, heat generated by the friction of cutting tools has to be carried away by the tool, by air stream or by coolant. Most machining of plastics is done dry. Since some compounds of the new setting plastics, such as the phenolics and ureas, frequently contain abrasive fillers, tools may be dulled easily. Under conditions of improper speeds and rates of feed, tools may even burn. Another phenomenon that must be taken into account is the softening tendency of some plastics. In machining these, the friction heat generated will heat up the plastic surface, causing it to become gummy. As a result the tools build up a film of burned resin. In the case of high-speed drills this causes sticking and possible cracking, and consequently inaccurate work.

Courtesy Bakelite Corporation

Molded plastic parts are rough finished to remove flash from the parting line and from openings before any necessary machining operations are carried out. After machining, the parts go back to the finishing room for final polishing and buffing operations

As in all fine machine work, tools must be kept sharp. Lapping or honing the cutting edge is helpful in prolonging tool life and speeding the machining operations. Stellite metal-cutting tools are excellent for the machining of all types of plastics and will be found economical to use when long production runs are required.

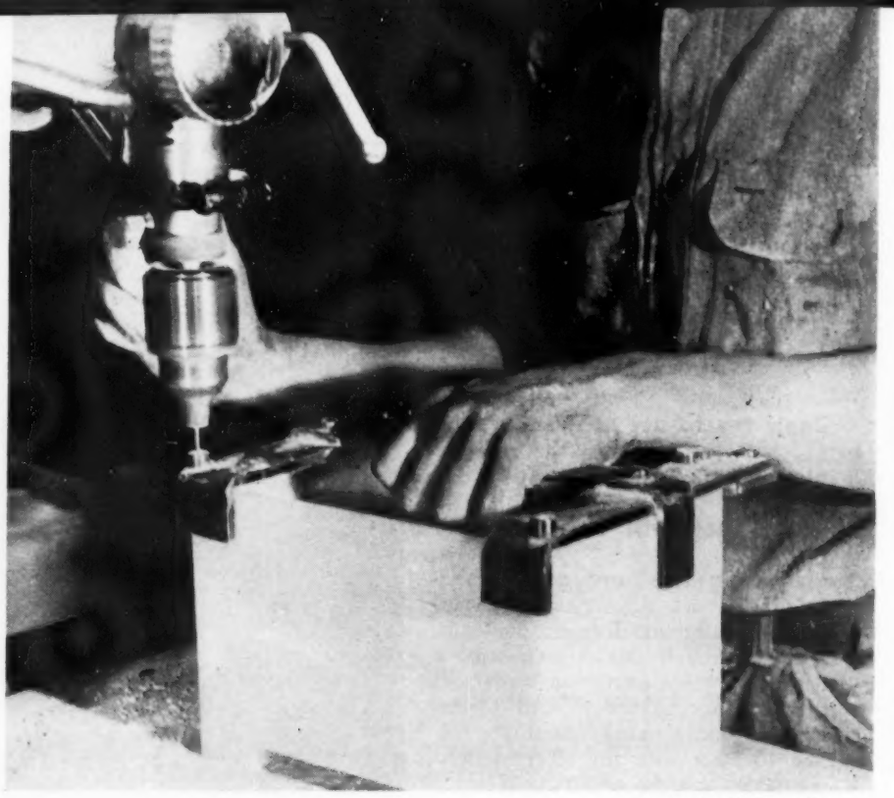
For maximum efficiency in drilling holes up to $\frac{1}{4}$-in. diameter, it is recommended that drills especially designed for plastics be used. These drills are available with 60- to 90-deg. included-angle points and with polished flutes, which are wider than standard drill flutes and have a slow helix. Tests indicate that a 60-deg. included-angle is desirable for sections up to $\frac{3}{16}$ in. thick, and a 90-deg. point is best for thicker sections. A slow helix works best for through holes and a fast helix is best on blind holes. A 15-deg. lip clearance is provided by the tool.

Drills must be backed out and cleared frequently. This will free chips, especially in drilling deep blind holes. An air jet, directed into the hole and on the drill point, will increase

When drilling plastics, the drills must be backed out and cleared frequently. Special drills with 60 to 90 deg. points and highly polished flutes are available for such operations. An air jet often will help speed up drilling operations in plastics by keeping the drill cool

High-speed steel taps (Center) that have been nitrided or chromium-plated are recommended for threading small holes in plastic articles. Three-flute caps give best results

High speeds characterize lathe operations on plastics. (Far right) For some of these materials, wood-turning tools can be employed with good results



Courtesy Catalin Corporation

the production of the standard drill 20 to 30 times before resharpening is required. Speeds of 100 to 300 ft. per min. are ordinarily used for drilling, but for materials containing inert or abrasive fillers a slow speed of approximately 75 ft. per min. should be used.

When drilling laminated plastics, grind the lip thin with little rake. Plenty of clearance will prevent splitting and grabbing. The drill should not be forced. It should be kept sharp and light pressures used. Since the material shrinks, a slightly oversize drill is usually specified. For through holes, it is good practice to back the plastic with solid material, or to use jig plates above and below. When drilling parallel to the laminations, a flat or "bottom" drill will usually avoid splitting.

When drilling cast phenolics the drills sometimes cut about 0.003 in. undersize. Speed should be as high as possible without burning and the tool should be backed out often. Negative rake helps to clear the drill.

Soap Used as Lubricant

For cellulose acetate, polystyrene and acrylics, slow drill speeds will minimize the tendency to heat up. The use of water as a cooling medium will prevent the material from softening. Soap can be used as a lubricant for holes over $\frac{1}{8}$ in. in diameter. Drills should be backed out frequently to clear chips. Light feeds will avoid strain and limit consequent tendency of the material to chip or develop strain cracks after being worked. Highly polished or chromium plated drills prevent subsequent cracking or crazing of the molded piece.

Parts molded from vinyl plastics can be drilled in much the same manner as other synthetic materials. Standard drills and the usual feeds are used. For deep holes, those whose depths exceed twice the drill diameter, drills with extra large flutes should be used.

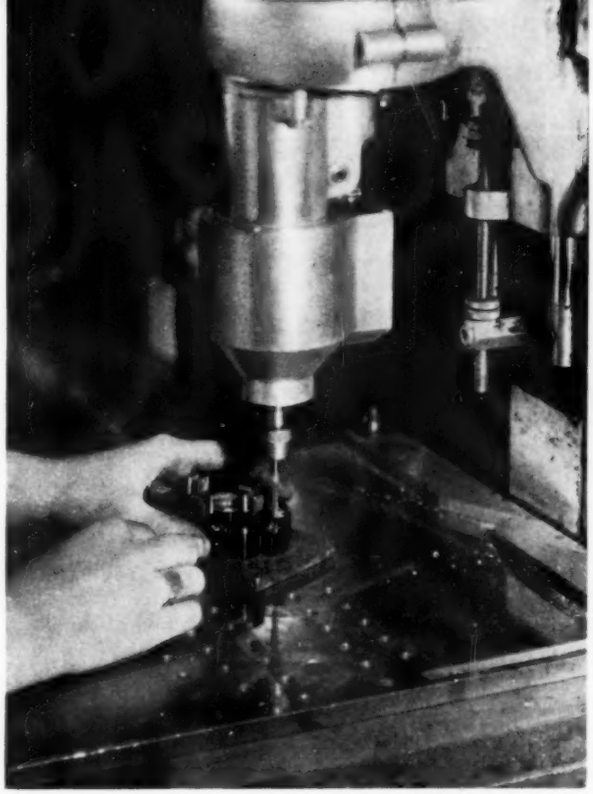
For drilling small holes in styrene or vinyl plastics, speeds of 4,000 to 6,000 r.p.m. are recommended. When the feed is kept as high as practical, the drilling time will be minimized. The reason for this is that the shorter the drilling time, the less is the tendency for the bit to raise burrs around the edge of the hole. When the hole is being drilled properly and the operation is most efficient, the chip will emerge in a tight helix similar to that produced while drilling mild steel. It should be noted, however, that this type of chip is not always produced—the chips are smaller if greater amounts of filler are present in the resin.

In the design of jigs for drilling, close-fitting drill bushings should be avoided. Such bushings increase the friction on the drill and also increase the tendency of the chips to plug up the drill flutes. If the operation is such that a drill bushing is essential, a floating leaf or templet should be employed. When using a templet, the hole should be spotted with the templet in place, using the drill size corresponding to the final hole size, then the templet should be removed and the hole completed. Pilot holes should be avoided, except in special instances when the hole is to be reamed or counterbored. High-speed steel drills having polished flutes are generally recommended. The use of soapy water or water as a coolant will also facilitate the drilling operation.

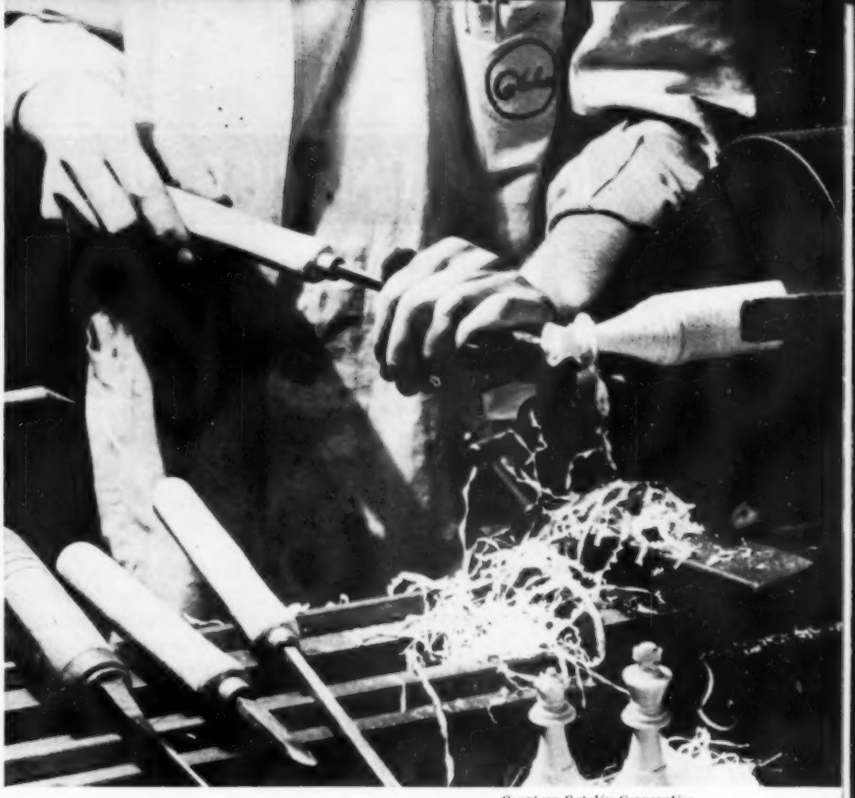
It is not common practice to ream in molded plastics. Reaming is used primarily to remove light fins or flash in holes. Where it is necessary to offset tapered holes, good results can be obtained if an expansion reamer is used. In conjunction with a self-centering floating holder, a fast feed and slow speed—one not over 50 to 100 r.p.m. —should be used. On thin sections, not over $\frac{1}{8}$ in. thick, holes should be drilled within 0.001 in. of size and a hardened and polished rod can then be used to burnish the hole to the desired dimension.

Three-flute Taps Work Best

High-speed steel nitrided and chromium-plated taps are best for the internal threading of small sizes. Speeds used range from 40 to 54 ft. per min. Taps should have three flutes, rather than the four commonly used in machine work. A negative rake of about 5 deg. on the front face of land will in some measure help avoid binding of the tap in the holes when backing out. Small holes can be tapped dry. Water is a better tapping medium than lard oil or kerosene. Machine taps 0.002 to 0.005 in. oversize are recommended, these give 75 percent of full thread to prevent the tap from breaking. A slight chamfer or countersink will minimize uplifting of material around the edge of the hole. Holes larger than $\frac{1}{4}$ in. in diameter should be molded-in rather than threaded or tapped later.



Courtesy General Electric Company



Courtesy Catalin Corporation

except where very thin sections are concerned.

Standard machine pipe tapping and threading dies can be used satisfactorily on parts molded of vinyl plastics. The traverse should be single and uniformly continuous. Speed, which should be moderate to slow, is limited only by the rate of heat development. On lathe operations, the threading or chasing tool should be relieved considerably in order to reduce side friction. Any form of thread can be used, but the American National Standard for machine screws is most satisfactory.

Threaded inserts molded in the part will obviate the need for drilling and tapping small holes in molded pieces. On side or oblique holes in molded plastic housings it is desirable to use inserts which can be drilled and threaded after molding. This is necessary because the flash may enter the threaded holes because of their positions in the mold cavity. Another problem which may arise is that of reshaping or retapping of threaded holes in brass inserts. This may also be necessary with holes already threaded in molded parts because of shrinking variations of the finished molded dimension.

Use More Rake on Tools

In turning, facing and boring operations on phenolic molded parts, tools having less clearance and more rake than those used for steel or other metals are recommended. Cutting speeds are 200 to 600 ft. per min. for high-speed steel tools and 500 to 1,500 ft. per min. for Stellite tools.

In the turning of acetate and polystyrene molded parts, tools should have zero rake and plenty of clearance set at an angle of 60 deg. to the spindle. Cuts should be made at a surface speed of 65 ft. per min. and a feed of 0.010 in. per revolution. A smooth surface is obtained with a 0.020-in. depth of cut.

In turning cast phenolics, tools commonly are given zero or slightly negative back rake and 15- to 18-deg. clearance. Tools must be sharp and best results are secured when the chips are ribbon-like. For facing cast phenolics, tool speeds range from 450 to 6,000 ft. per min. Facing tools sometimes are set slightly above center. Too pointed an edge on facing tools tends to create chatter. On rod machines, formed circular cutters and cutoff tools can be used to advantage, or cutoff can be done with a saw.

Turning acrylic plastics is done with tools having zero rake and plenty of clearance, set at an angle of 60 deg. to the spindle. Cuts should be made at a surface speed of about 65 ft. per min., and a feed of 0.010 in. per rev. A smooth surface is obtained with a 0.020-in. depth of cut.

For parts molded of vinyl plastics, simple turning, facing, boring, and chasing operations are performed satisfactorily with most ordinary metal-cutting tools provided that the front and side clearances of the tool are increased by about 50 percent over the clearances used to machine steel. The added clearance reduces the rate of heat formation and produces good surface finishes and free-flowing chips. An increase in rake angle, made by hollow grinding the top cutting face, offers some advantages in directing the chip away from the work. However, the accompanying reduction of cutting angle results in a greater tool wear. With surface speed between 250 and 300 ft. per min., depths of cut can be as high as $\frac{1}{4}$ in. and rates of feed up to 12 in. per min. are possible. Higher speeds and feeds can be used with lighter cuts.

Cut Off at Slow Speed

Cut-off tools should also be ground with increased front and side clearances. In using such tools, the surface speed should be reduced to approximately one-half that used while turning. Slower speeds tend to roughen the cut surface, whereas faster speeds may cause overheating of the material.

For screw machine operations on laminated tubes it is better to specify a smaller inside diameter than required for finished size, or to use laminated rod and drill it to size. Cutting feeds recommended are: 0.007 to 0.015 in. per revolution for drilling; 0.010 to 0.015 per revolution for turning; 0.002 to 0.005 in. per revolution for cutoff; and 0.002 to 0.003 in. per revolution for forming.

The following spindle speeds are recommended for hand screw machines: 1-in. diameter and over, 800 to 1,000 r.p.m.; under 1-in. diameter, 1,500 to 2000 r.p.m.; $\frac{7}{16}$- to $\frac{5}{8}$-in. diameter, 3,600 r.p.m.; $\frac{1}{8}$-in. diameter and under, 5,000 r.p.m. Flooding with lard oil and kerosene tends to increase production and to prolong tool life.

This discussion will be concluded in an early issue.

Good Dowels Extend Die Life

BY H. R. HAGEMAN

The correct use of dowel pins and properly designed pilots are often important factors in reducing die maintenance cost

SCREWS AND DOWELS for holding die parts in accurate alignment should be tight enough to prevent falling or die misalignment, and yet be so fitted that they will not seize or gall when driven in and out. The one exception to the latter is in press tools that will not be taken apart during their life.

The dowel shown in Fig. 7 has both ends pointed slightly, is pack hardened and is ground to standard fractional sizes within close limits by commercial producers. This type of dowel can be utilized to reduce die maintenance costs. It should be made a light drive fit by lapping the holes, and never by stoning a few ten-thousandths off the pin. Such a dowel can be driven from either end without shearing. Some plants and especially small shops consider the cost of these dowels prohibitive and use pins made of unhardened drill rod. The latter may be suitable for cheap or temporary press tools, but cannot be reconciled with low die maintenance cost.

Hardened pins having $\frac{1}{4}$-in. taper per foot are not as a rule satisfactory. When driven tightly enough to insure against jarring loose, they have no advantage over the straight ones.

When fitting standard straight dowels, it is not good practice to ream or lap the holes to a light drive fit for about three-quarters of their length, leaving the remaining portion to be sheared or pressed in tightly. This method is a cheap substitute for good workmanship since the pin will appear to be fitted whether it is or not. Such a pin can be driven out in only one direction. The short fit will eventually wear loose if the pin is removed frequently.

The use of short pins made a tight fit in one member and a sliding fit in the other is good practice. If the system of doweling shown in Fig. 8 were used whenever practicable, such slip dowels would give little trouble. Here the pins are made tight in the unhardened member; when both die members are unhardened, a bushing can be inserted to receive the slip end of the pin as shown in Fig. 9, providing sufficient accuracy is demanded to warrant the expense. However, one thing that discredits the slip dowel is its dependence on a small beveled slot filed adjacent to the dowel barely deep enough to start the end of a screwdriver for the purpose of separating the members. This can be overcome by milling beside each pin a slot deep and wide enough to admit the end of the special small pinch bar shown in Fig. 10. The word "lift" stamped over the slot indicates that the pins are not to be driven.

Use Slip Dowels In Blind Holes

Dowels for blind holes cannot be removed easily and should be avoided whenever possible. When used, they should be fitted as slip dowels.

When a hole is inadvertently reamed too large or becomes enlarged through much use, there are available commercial pins ground to some exact diameter larger than nominal, such 0.005-0.0015 in. oversize. They should not be supplied so freely that careless workmanship results. Not only are they liable to become a nuisance when different diameters are used on one job, but they cause extra work in sorting when an obsolete job is dismantled and the dowels salvaged. In any case, oversize pins should have some means for identification not likely to be obliterated, such as long points.

For work requiring frequent dismantling, the method shown in Fig. 11 can be used to eliminate dowel pins. Here the punch or pad *A*, as the case may be, is located and fastened by screws, after which a cast-steel frame *B* is riveted to the punch holder *C* with close-fitting rivets. Wedges, adjustable by screws preferably inserted from the upper side, will keep the punch or pad in place. Where this method is used, a quantity of the frames and wedges in three or four standard sizes should be kept in stock. In designing dies for use with these frames, the members to be located are made to conform with the standard frame dimensions.

Avoid Press-Fit Pilots

One of the most prolific sources of trouble in press tool maintenance is that of incorrectly designed pilots. In general, those with press fits should be avoided. Some die designers think it best to specify press fits because obviously pilot shanks should be fitted tightly to prevent the pilots either from pulling out should they pierce the work, or from dropping out and damaging the punch and die. But from a die maintenance viewpoint, consideration should be given the following items:

1. Any hardened pin having a shank that is a drive or tight press fit in a hardened steel part is apt to snap when driven instead of being pressed into place; the next blow after the shoulder is seated does the trick, no matter how squarely the blow may be delivered. If it should not break during assembly, it might do so should the press operator accidently trip the press before the pierced hole is in line with the pilot.

2. When it is necessary to place a pilot in a section of a punch that is so narrow that a comparatively thin wall is left around the pilot hole, the insertion of a very tight pin is liable to crack the steel.

3. When the pilot shanks are small and are of the press-fit variety, it is nearly always necessary to dismount the punch from the holder to permit removal of the pilot which, of course, must be done each time the punch is ground. This is often difficult and costly. Furthermore, the punches are usually held in place by screws and

straight dowels, and their frequent removal and replacement eventually destroys the accuracy of the tool.

4. When a knock-out hole is provided, such as shown at *D* in Fig. 12, only a spring-steel drift pin and plenty of good luck will remove the pilot.

When objections to press-fit pilots such as *D* in Fig. 12 are recognized, other designs will suggest themselves, among which are the following:

1. A threaded shank held by a slotted nut secured by a spring washer, such as *A* in Fig. 12, can be used.

2. Type *B* is very satisfactory when conditions are suitable.

3. Disappearing or spring-backed pilots *C* are good only when press operators are careful and the stock works freely in the guide. If the previously pierced hole is not advanced near enough to the center for the pilot to finish locating it, the pilot will simply work up and down without functioning, thus spoiling the work until noticed by the operator.

4. Pilot *E* is little more than a conical-headed screw and is not recommended.

5. The pilot shown at *F* is good only when the shank is large enough to receive a tapped hole. The shank must be tight enough to prevent turning while the screw is being applied. The screw also may have a spring washer under its head.

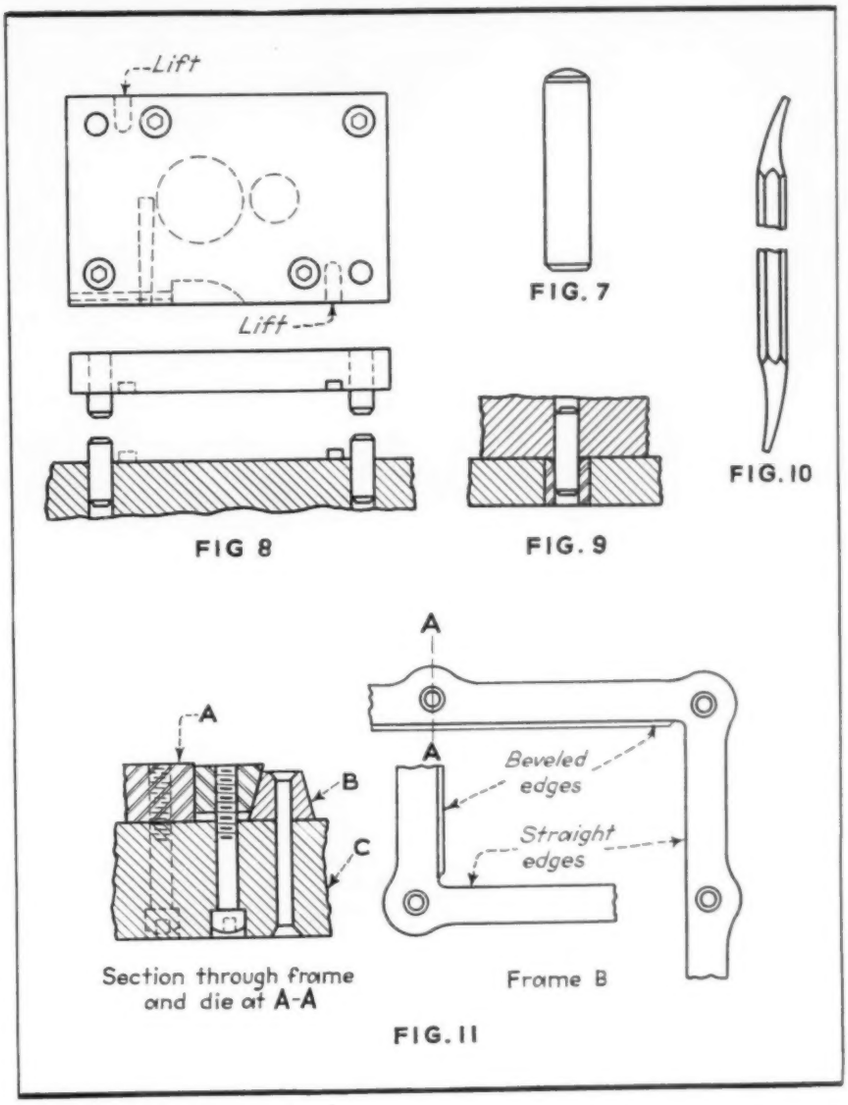
6. Pilot *G* can be used when drilling and tapping for the setscrew is practicable. It is especially good when the working end of the pilot is other than round.

The temptation to make the shank nearly as large as the head of the pilot with the idea of increasing its strength should not be followed because the small shoulder left to receive the thrust may wear to a taper and permit the head to be forced into the hole, thus cracking the punch.

When pilots are held in the punch pad instead of being inserted in a blanking punch, they can be mounted in the same manner as piercers, the slender ones being supported by quills. Means for their removal should also be provided in case of breakage.

The use of offset pilots is evidence of either an error in design or an engineering change. Such pilots are not recommended. In case of breakage the toolmaker has to waste time replacing them, thereby increasing maintenance cost. This can be avoided by re-working the punch to bring the pins into the correct location. Custom built dies furnished with offset pilots should be rejected.

Part 3 of this article will appear in an early number.



The slip dowel in Figs. 8 and 9 can often be used to advantage. For work requiring frequent dismantling, punches and pads can be held in cast-steel frames by wedges as shown in Fig. 11

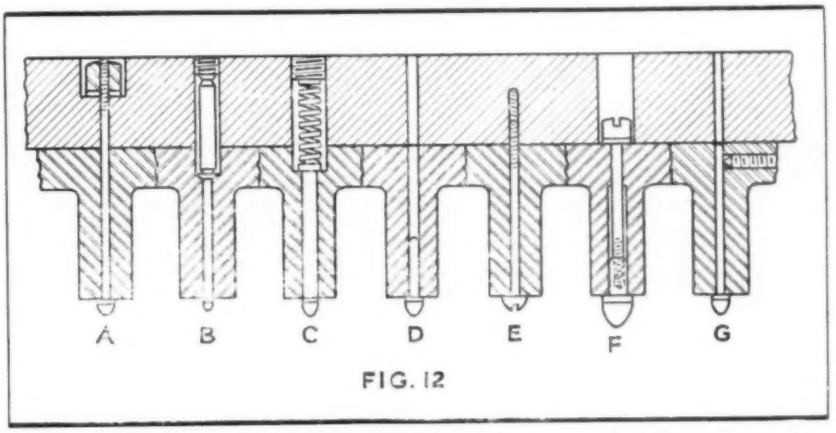


Fig. 12—Press-fitted pilots *D* are difficult to remove and replace, are apt to break during assembly or operation, and generally are conducive to troubles that increase die costs. The other designs shown here, except *E*, can be substituted, the selection depending on the operation and function of the die

When the locomotive has been stripped of running gear and the boiler, the frame is flame cut at the center of the front pedestal jaws, and the cylinders are turned over on the erecting floor just ahead of the pit

Continuous cracking at cylinder casting fit created an unsual repair problem. New and wider frame sections were installed

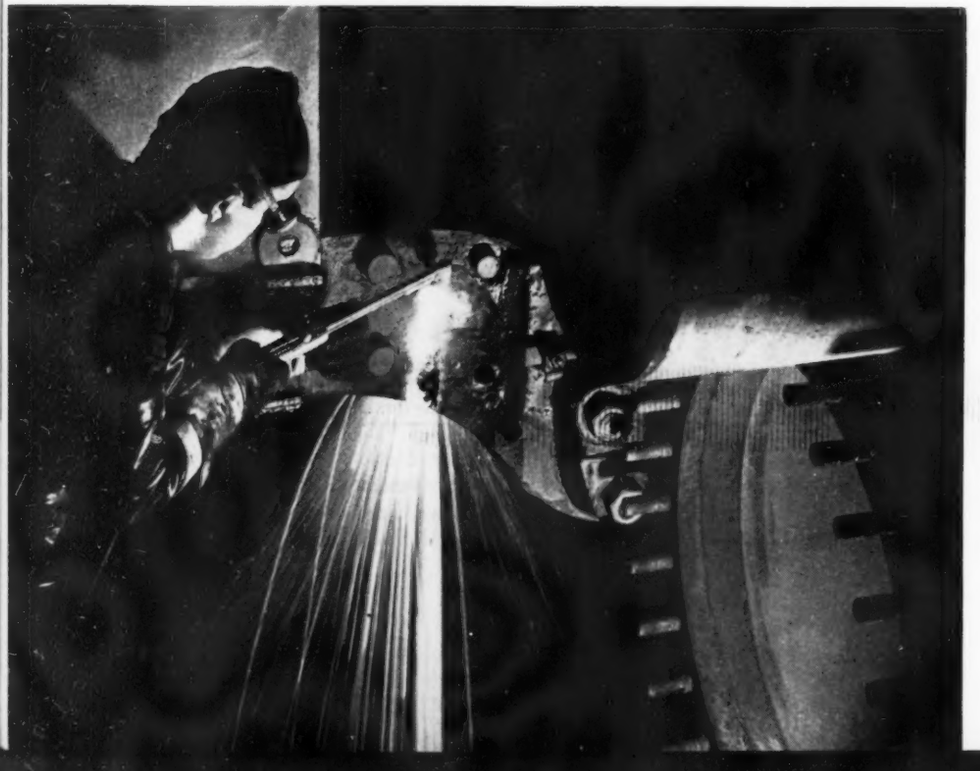
THE MAIN LINE of one New England railroad runs through the Berkshire Mountains. The frames of its 2-6-4 locomotives handling manifest freight over steep grades and around sharp curves were found to be cracked at or near the cylinder saddle. In an early effort to overcome this difficulty, reinforcing plates 2 in. thick were bolted and welded to the inside of the frame at the cylinder castings. But the frame fractures continued to occur. The difficulty is now being overcome by removing the frame ahead of the front pedestal jaws and replacing it with new sections 2 in. wider at the cylinder-casting fit.

With the locomotive in the back shop and stripped of running gear and the boiler, the frames are flame-cut at the center of the front pedestal jaws.

Welding Saves Locomotive Frames

BY H. A. HOCKING, APPLIED ENGINEERING, AIR REDUCTION COMPANY

The frame ahead of the cylinders is also cut with an oxyacetylene torch. The king-pin filler block and head-log casting are removed; all bolt holes in these castings are filled by welding and the welds ground smooth. These castings are redrilled when applied to the new frame sections

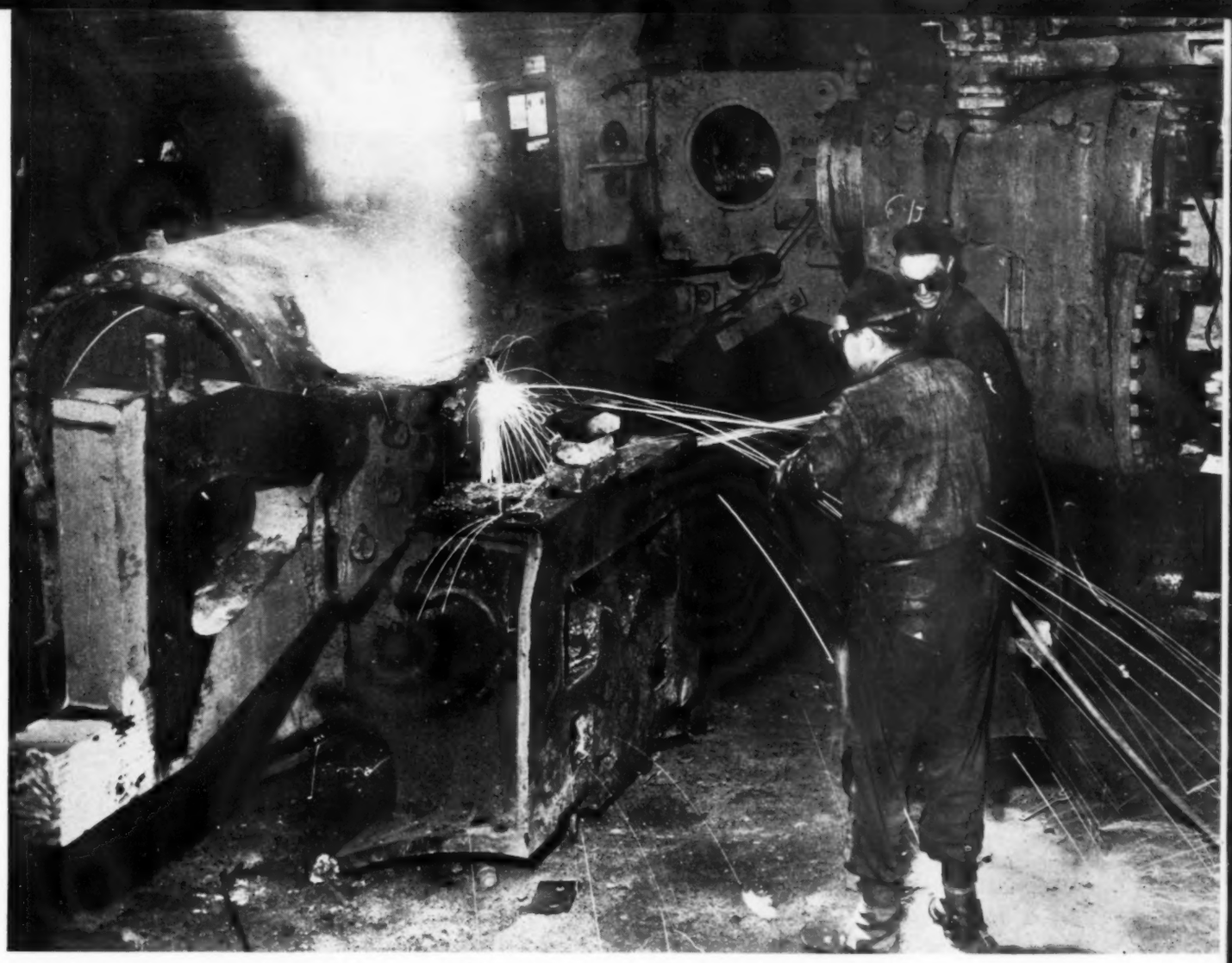


They are also flame-cut just ahead of the cylinders so that this portion can be set aside and the king-pin filler block and headlog casting can be removed for welding to the new frame section.

The cylinders are turned over by the shop crane and all cylinder-saddle splice bolts removed. With the cylinders separated, the frame bolts are lanced and driven out, and the frame sections removed. Frame bolt holes in the cylinder castings are welded and ground smooth for later drilling of frame-bolt holes when the new frame sections are fitted to the cylinders.

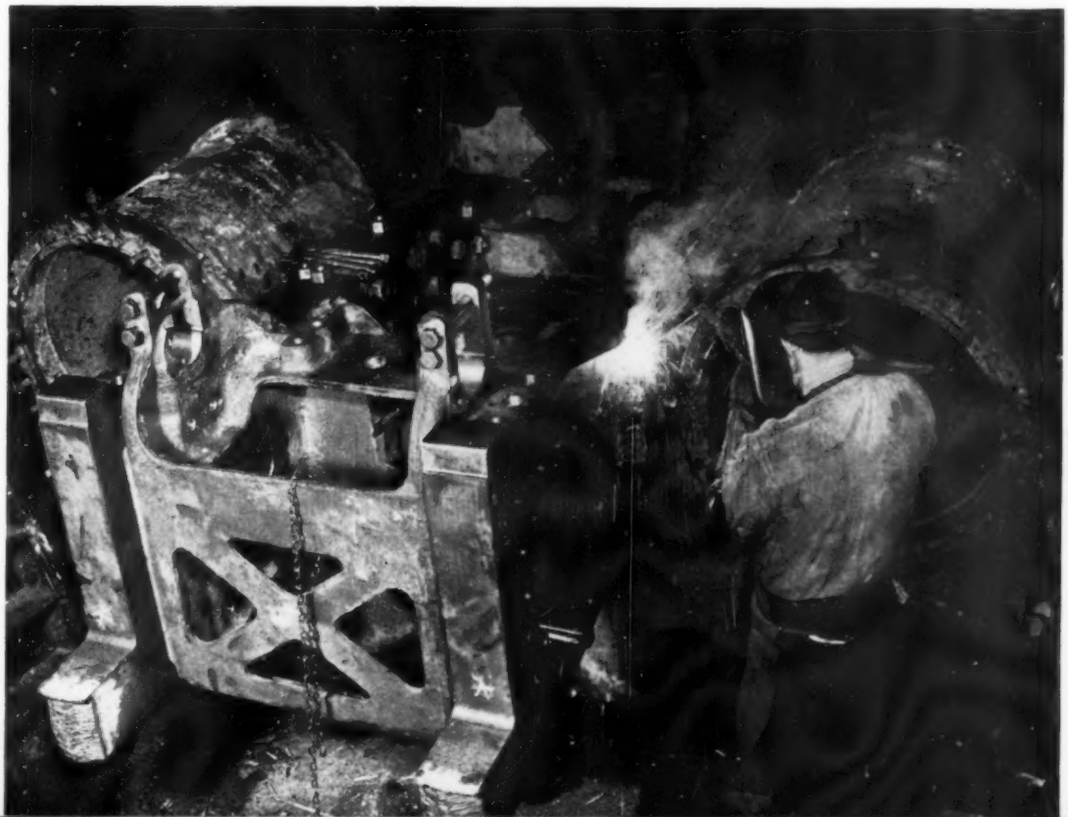
The new frame sections are laid out and drilled. They are then set on leveling blocks over an erecting floor pit and aligned. Several permanent frame bolts are applied in the rear filler block and engine-brake trunnion casting; the king-pin filler block and headlog casting are bolted temporarily in place.

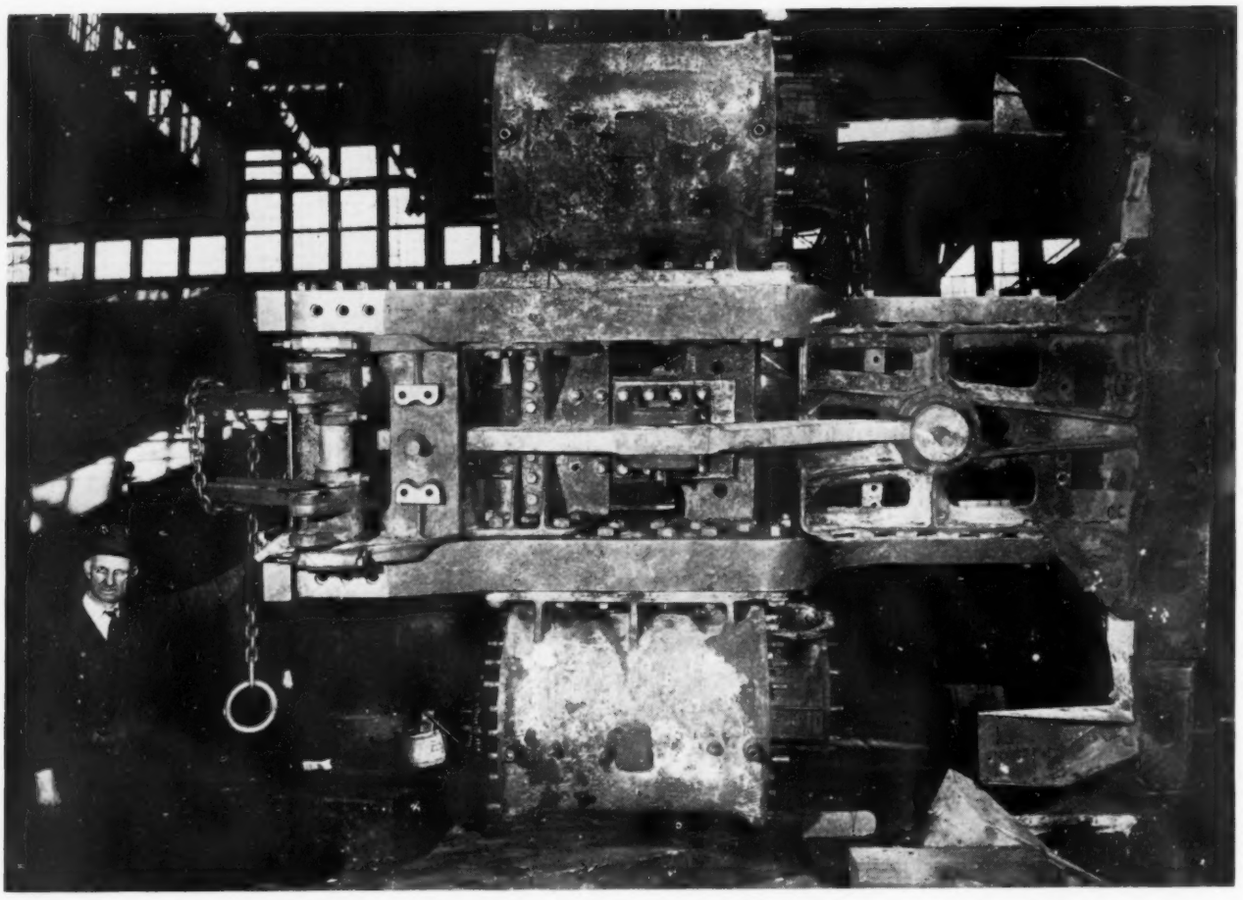
The cylinder castings are set on the new frame section and aligned, using temporary bolts at the frame and splice fits. The splice-bolt holes are reamed



After the cylinder splice bolts have been removed the cylinders are separated and the frame bolts lanced. When the frame sections have been removed, holes in the cylinder castings are welded and the frame fits are ground smooth

After the frame bolts have been fitted, the cylinders are welded to the frame. The frame sections are the same size at the pedestal jaws as the old sections. However, the width of the new sections at the cylinder casting fits is 2 in. greater than the old ones





Before the cylinders are again turned over and the frame aligned for welding, all work is completed on the rear filler block, the engine-brake fulcrum, main-spring equalizer. Holes in the king-pin filler block and head-log casting are drilled and reamed, and the bolts fitted after the frame has been welded

and new tapered bolts applied and pulled up tight. Two permanent frame bolts are fitted at each cylinder. The assembly is then turned over to permit easy access during drilling, reaming and fitting of all remaining cylinder-casting frame bolts. With these bolts applied, the cylinder castings are welded to the frame. This is followed by drilling, reaming and applying the remaining frame bolts in the engine-brake trunnion casting, rear filler block and fulcrum casting for the main equalizer. The application of the main spring equalizer completes the work while the cylinders are on the erecting floor in an inverted position. The entire assembly is then turned over by the shop crane and aligned with the old section of the frame for welding.

The completed cylinder assembly is aligned with the old frame, alignment being maintained by U-bolts drawn tight against heavy iron pads set against the top of the pedestal jaws. Two welders work simultaneously on each side of the frame

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! ***For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.***

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the *first* to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their $1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a $10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

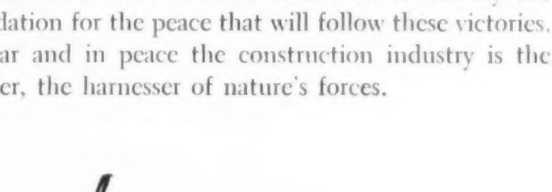
All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.



President, McGraw-Hill Publishing Company, Inc.

The job of sorting disassembled parts for scrap to aid in the nation's stockpiles is undertaken by V. J. Roddy, left, assistant general manager at the American Screw Company and Fred Brown, mechanical engineer. Parts which may be used in maintenance of equipment are sorted and stored, thereby conserving metal at the source and reducing demands on manufacturers

Scrap Drive Helps Plant Efficiency

Scrap search ousted obsolete machinery, increased supply of maintenance parts and improved plant housekeeping practices

THE SALVAGE PROGRAM instituted by the American Screw Company has originated methods of increasing plant efficiency and of easing many of the dislocations caused by the war.

In going beyond the realm of production scrap and making careful inventory of machines and equipment, the plant put itself on a new basis of increased efficiency. First, obsolete equipment which, because of its special nature could not be converted to war work, was marked for shipment back to the mills. Obsolete equipment which was so worn as not to be worth reconditioning, was taken apart and sorted into trays and bins, and suitable parts retained for the maintenance and repair of machines in production. So well did this system work, that a new department in charge of issuing materials was established. There resulted a reduction of outside purchases, with the consequent reduction of delay due to priorities and slowness of delivery. By making use of old parts, the company conserves metal at the source and makes no demands on existing stocks, which might better stay unused for unavoidable emergencies.

The company has found that by scrapping all antiquated equipment, it has accomplished a thorough modernization of the plant. The management feels that the complete scrapping of old machines that do not have reusable parts is the practical solution to much of the nation's critical need for scrap, particularly since the rapid technological progress brought about as a result of the war will probably have the effect of further antiquating such units.

Another of the features of the campaign at the American Screw Company plants has been the practical method in which the Labor-Management Committee is organized with seven employee members of U.S.A.-C.I.O. and seven managerial employees. The factory manager acts as chairman and the president and ex-president of the local union act as co-chairmen.

The committees have made excellent progress in cutting down the amount of production scrap on the theory that the best way to conserve metal is to reduce its waste in operation. This eliminates the time and effort of reconverting the scrap to usable material and lowers production costs.

Another phase of the Labor-Management Committee activities is good housekeeping in the plant. After a complete job of cleaning up all the scrap in sight, efforts are now made to rid the premises of the salvage material as it collects. A daily scrap report must be made out by the responsible salvage collectors and sent along with the scrap to the central collection department. To date, this effort has been an unqualified success and no scrap has remained at the source of collection for more than one day.

The employers and workers participating in the campaign have turned an emergency into a victory. Confronted with the necessity of salvage and conservation they have collected a considerable quantity of badly needed scrap, returned certain reclaimable machines to the mills, gathered a back-log of maintenance parts and improved the quality and ease of their own production.

War Winning SUGGESTIONS

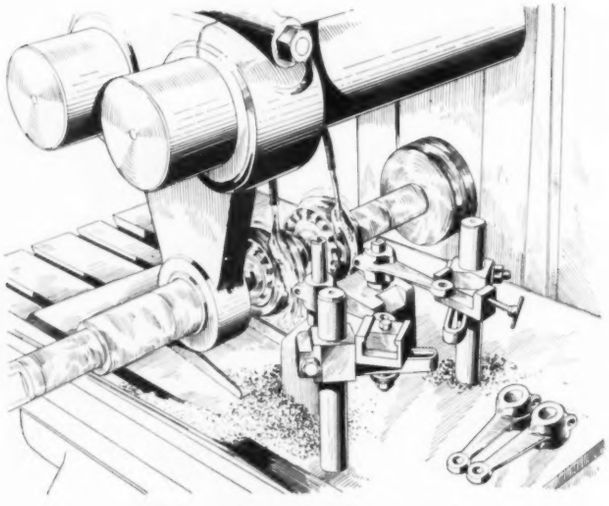
Forty Pieces at a Time

Brake cross shaft levers were milled two at a time at the Yellow Truck & Coach Manufacturing Company until one of the operators developed a method whereby 40 pieces can be milled at one time.

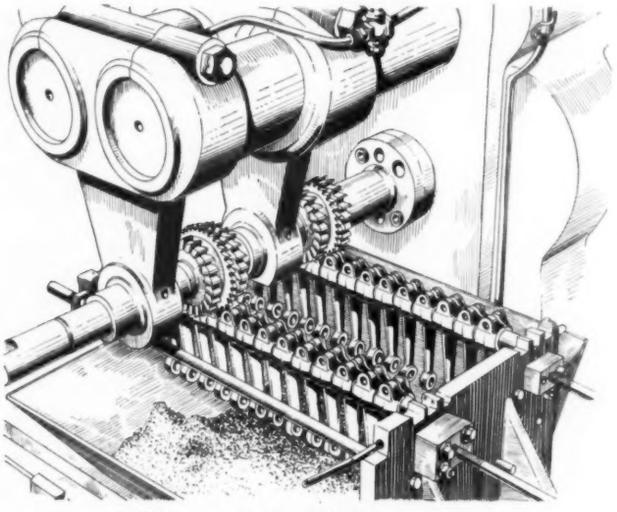
This part is about 6 in. long and about 1½ in. at its thickest part. In the old method, two pieces were clamped on the machine and when finished,the machine was stopped, the pieces were released and two more were loaded into position.

In the new method, 40 pieces are mounted on special arbors, and then the arbors are loaded in the machine. As can be seen in the sketch, 20 pieces are slipped on to each of two arbors, and they are then locked into position in a fixture on the milling machine. While these are being milled, another pair of arbors is loaded, ready for mounting in the miller, so that 40 pieces are now loaded in about the time previously required for two.

Naturally, it takes longer to mill 40 pieces than it does two, but the time saved is a third of the former time. The total time for milling one piece used to be 0.012 hours, whereas it is now done in 0.008 hours. *Suggested by Carlton Jones, Yellow Truck & Coach Manufacturing Company.*



Old method of holding work

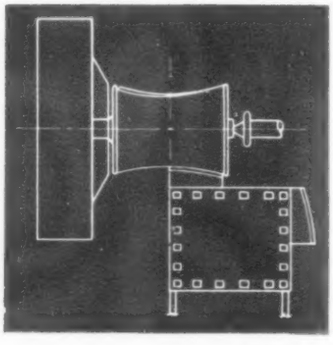


New method of holding work

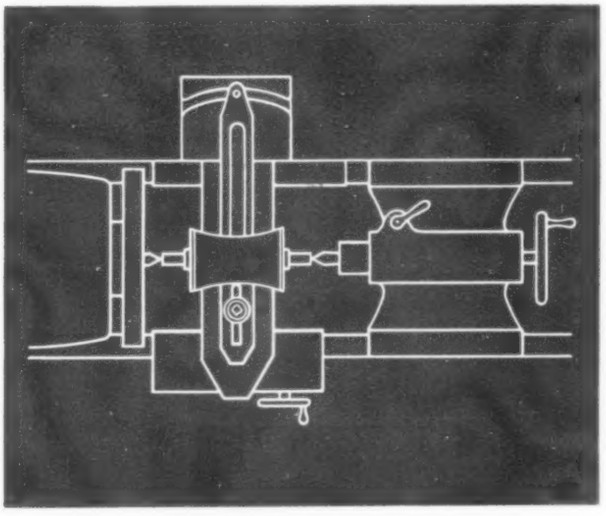
Machining Radius on Rollers

The 10½-in. concave radius on torpedo tube rollers was formerly machined with large special forming tools using a turret lathe at the Nordberg Manufacturing Company. This took considerable time and caused undue stress and wear to the machine. The broad-nosed tool for cutting this radius in a single operation required too much pressure to start the cut when cutting across the full face of the tool. When sufficient pressure was applied the tool would cut too deeply.

It was suggested that the radius be cut using a radius

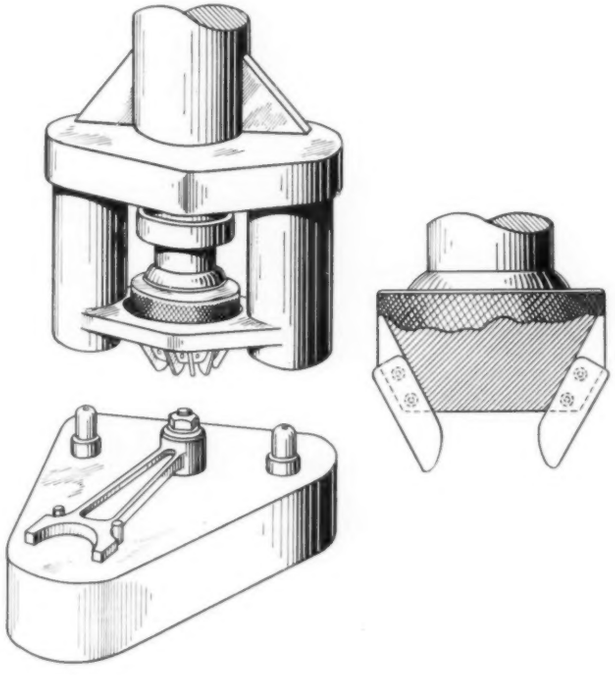


slide attachment on a 16-in. engine lathe and cutting with standard lathe tools. With this method the radius can be roughed in in two operations, leaving $\frac{1}{16}$ in. stock for finishing. It is estimated that the new method will save approximately 260 man-hours per year, as well as enabling the firm to release a turret lathe for other work. *Suggested by Stanley D. Smith, Nordberg Manufacturing Company.*



Fixture Eliminates Two Operations

Two operations were eliminated in milling the bosses on the pin end of fork and blade connecting rods by a suggestion contributed by an employee of the Packard Motor Car Company. The connecting rod is held in a fixture on the milling machine. A hollow mill descends on the piece, milling the outside surface and radius on one side of the boss. The cutter is then lifted, the rod is turned over and the same operation is performed on the other side. An inserted-tooth cutter is used.

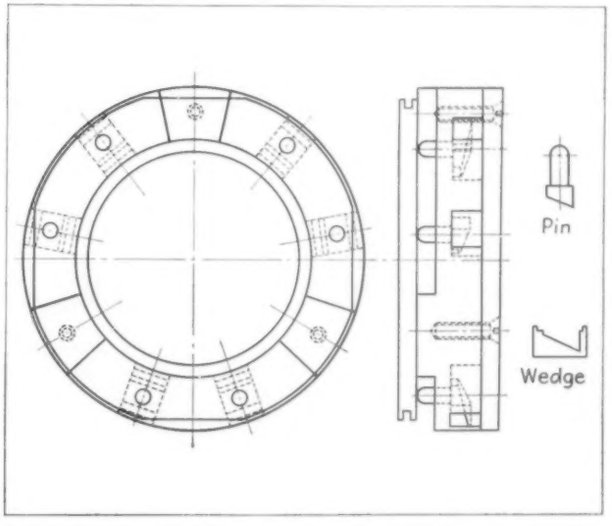


Because of the close limits on concentricity of the inside and outside diameters, the original method called for two separate operations. The first operation reduced the size to 1.880 in., while the second operation reduced it to 1.835 in.

The suggested change eliminated the first operation on each side of the connecting rod by the simple method of lowering the blade in the milling cutter, which reduces the cutting diameter and removes stock to a diameter of 1.845 in. in one cut. While this change leaves 0.010 in. more stock for grinding, two machines and four men are released for other work. *Suggested by Curt P. Kofahl, Foreman, Aircraft Engine Division, Packard Motor Car Company.*

Support for Facing Thin Parts

Two parts produced by the Wright Aeronautical Corporation are so thin that due to the meager support offered by the regular three chuck jaws in a turret lathe, the work had a tendency to spring away from the tool during the facing operation. Due to the fact that these parts have been previously warped by heat-treatment, they do not present a flat surface that will permit a solid backing.



A self-adapting device flexible enough to produce satisfactory work despite the warped condition of the part was developed. This device provides nine support points, three of which are fixed, and six of which are adjustable. The work support ring has three raised surfaces equally spaced. The other six points are pins which have a limited free motion perpendicular to the surface to be faced. These pins are located on a circle about an inch smaller than the outside diameter of the work support ring. Two pins are located between each pair of fixed location points.

A rectangular slot is milled through the ring at each of the six holes; on the side of the ring away from the work.

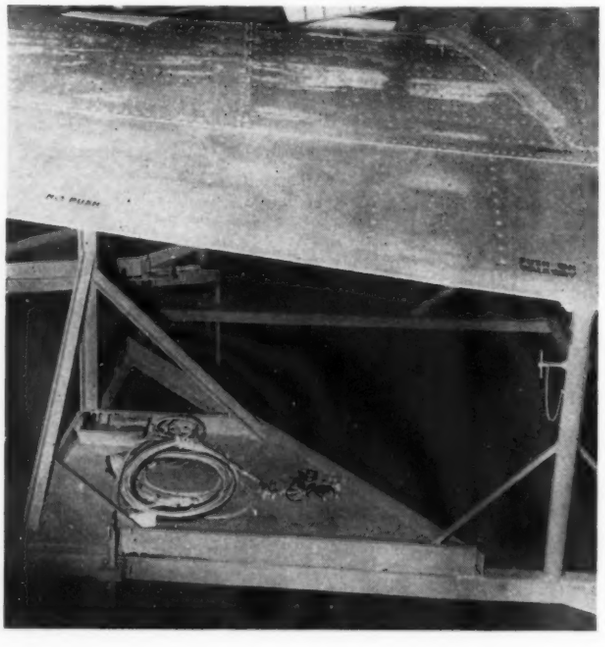
The center line of these slots are radii attached through the center of each hole. Each slot forms three sides of a rectangular hole, the fourth side of which is formed by a back plate. The pins have heads tapered at a 10-deg. angle from the back plate. Inserted in the slot, and free to move toward and from the center of the ring is a small wedge with a 10-deg. angle on the side towards the work. Shoulders at each end of the wedge limit the travel. When the wedge is moved toward the outside of the ring it exerts a cam action on the angular bottom of the pin, forcing it toward the work. The angle is such that no reciprocating pressure on the end of the pin can force the wedge back towards the center. The pin, therefore, cannot move away from the work as long as the wedge is not slipped back towards the center.

The work is chucked with this support ring behind it, so that the work touches the ring at the three raised points. The wedges are moved out until the pins touch the work. When the rotation of the chuck is started centrifugal force holds the wedges in the outer position so that the pin supports the work firmly until the operation is completed. *Suggested by D. Hatfield, Wright Aeronautical Corporation.*

Bins Hold Tools for Assembly

Workmen installing hydraulic tubing, gas lines and vacuum lines on airplanes had no place to keep their tools and materials except on the floor or in a bin some distance away, at one of the plants of the Curtiss-Wright Corporation. Since the airplane wings are moved up along the production line several times during an eight-hour period, the workers constantly lost time through moving their material.

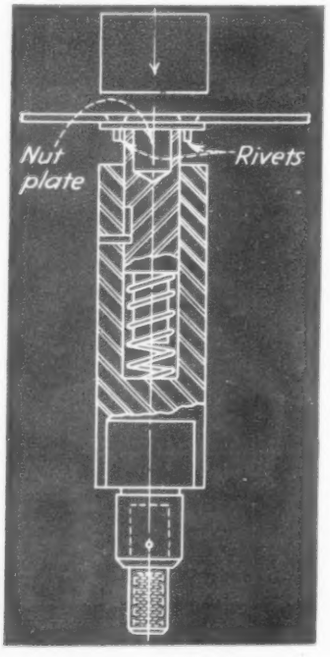
It was suggested by two employees that bins be installed on the dollies which carry the wings along the production line. These bins were simple to construct in one corner of the base of the dolly, and were made triangular in shape.



The workmen place whatever tools and materials they need in the bin when they start to work. As the dolly is moved along the production line from time to time, the men are able to continue work without interruption. It is estimated that the use of these bins saves 360 man-hours per week. *Suggested by J. A. Heiman and E. A. Westmoreland, Final Assembly Department, Curtiss-Wright Corporation.*

Nut Plate Riveter

Because of the construction of nut plates it was difficult to hold them in the proper position while riveting them to sheet stock. Two workmen at the Bell Aircraft Corporation designed an improved riveting anvil which provides the means for holding the nut plate square and concentric while the rivets are inserted and upset. If placed on a solid anvil,



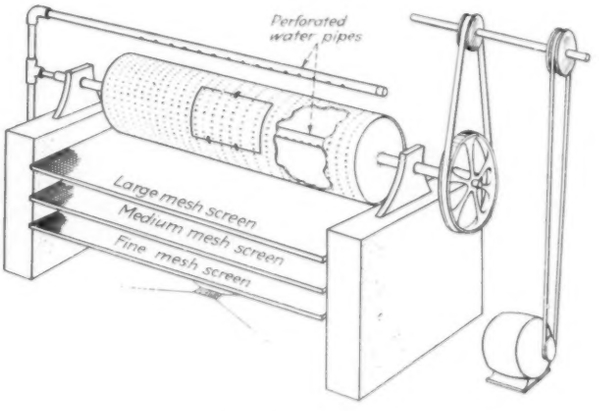
the rivets are pushed up out of their holes so that they do not head properly.

The nut plates fit into a depression in a piston in the anvil. A pin in the side of the anvil fits into a vertical slot in the piston and limits the travel of the latter. A compression spring under the piston holds it in the raised position. With the nut plate in position across the top of the piston, the sheet stock is placed over the nut plate and the rivets are inserted. When the riveting hammer strikes the sheet stock, it depresses the piston so that the rivets are upset against the solid anvil. *Suggested by Matthew A. May and Frank I. Majeski, Bell Aircraft Corporation.*

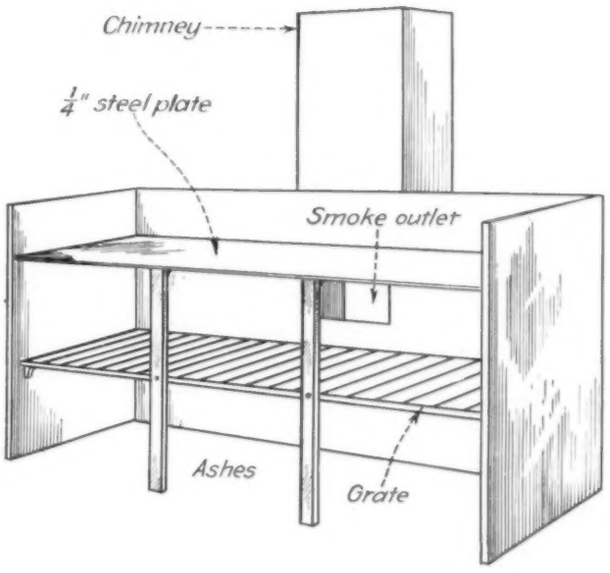
Aluminum From Floor Sweepings

Aluminum scrap borings and turnings and floor sweepings containing aluminum are gathered from the various departments at Fairchild Aircraft, and washed through the material washer. The material is placed in the tank of this washer, and the tank revolves while water is run on it from above and from the center of the tank. The tank is perforated with $\frac{1}{8}$-in. holes. Scrap small enough to pass through these holes is caught by three screens successively of large, medium and fine mesh. About 8 min. are required to wash the dirt from a tank full of scrap.

After drying by exposure to the air, the borings, turnings and aluminum dust that has been separated from the dirt are laid on a hot plate in order to burn small bits of wood, paper, etc., that are mixed in with the metal. This hot plate is a thin sheet of steel on which the scrap is placed and beneath which the fire is built. What remains is clean, unsegregated aluminum scrap.



Material washer cleans out dirt

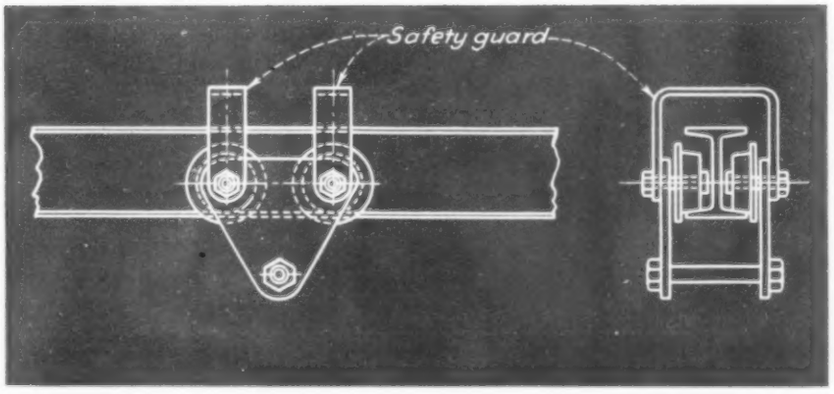


Hot plate burns out wood and paper

One of the most important features of this process is that dirt swept off the floor is yielding aluminum dust in fairly large quantities. Approximately 2,000 lb. of dust, borings, turnings and shavings are being accumulated per month. Since several alloys are mixed together into this scrap, analysis may put it into a low classification, but it can be used. *Suggested by McClelland Altemeier, Fairchild Aircraft Division of Fairchild Engine and Airplane Corporation.*

Safety Guard Stops the Fall of Hoists

When a hoist is overloaded, the rollers have a tendency to spread away from the rail on which they rest. If this spread is sufficient, the rollers may fall completely off the hoist, causing a serious accident. The addition of a safety guard over each pair of rollers will prevent this. This guard is made in the form of a U with the ends bolted to each side of the hoist and the center passing across the top of the rail. The addition of this guard not only strengthens the rollers, helping to keep them from spreading, but if the hoist is so badly overloaded that they still spread, it will stop the fall of the hoist. When the rollers give way, the center portion of the guards will catch on the rail and rest there, holding up the hoist until repairs can be made and the hoist is ready for operation again. *Suggested by August Skiers, The Vilter Manufacturing Company.*



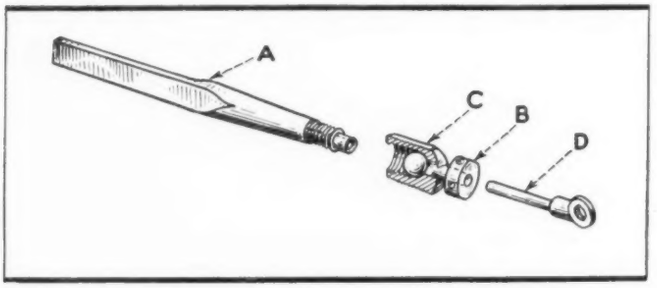
IDEAS FROM PRACTICAL MEN

Indicators Held in Toolholders

BY C. F. FITZ

In using an indicator on machine tools, when toolholders are used to hold the cutting tools, considerable time is lost in changing from the standard toolholder to the special indicator holder and back again to the toolholder after the job is lined up.

This lost time can be eliminated by making a special indicator holder, as shown in the drawing, which



Indicators can be used on machine tools without changing from standard toolholders to special indicator holders by using this indicator holder which fits into the standard toolholder

fits into the standard toolholder after the cutting tool has been removed.

Shank *A* is made from square stock the same size as the cutting tools used in the toolholder of the machine in question. One end is threaded and cupped to form a bearing for the ball end of part *B*. Part *B* is held in place and adjusted by the knurled sleeve *C*. Part *D*, which holds the indicator, can be inserted in part *B* either parallel with the center line or at right angles to the center line, since part *B* is crossdrilled as indicated.

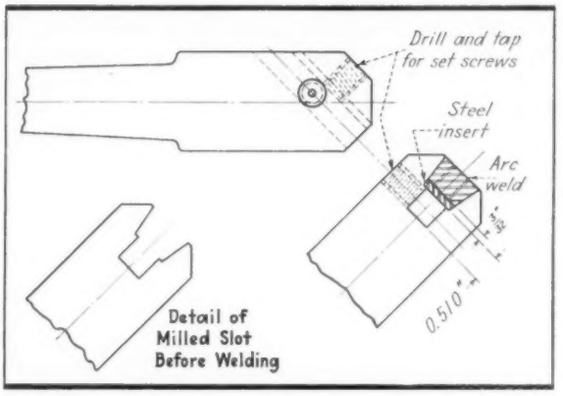
All parts are made of tool steel properly heat treated to reduce wear. This idea has worked so well in our shop that we have made holders to fit all sizes of toolholders.

Square Toolbit Slots Simply Made

BY R. A. DICKSON
Lockheed Aircraft Corporation

A simple method of making square toolbit slots in various types of holders that has saved considerable time and money is shown in the drawing. In all cases where this method has been used, it has made a slot equal to or superior to any, except those made by broaching—a method that is not always available.

A slot is milled through from the outside to the



The square slot for the toolbit was made in this fly cutter bar by milling a slot, putting in a steel insert, and filling up the slot with weld metal

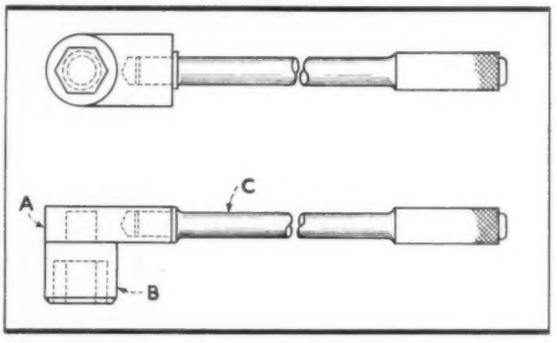
proper depth, a steel insert is located in the larger portion of the slot, and the remainder of the slot is filled in completely with weld metal. After this has been done the setscrew hole can be drilled and tapped through the weld metal and the steel insert. A second setscrew hole is placed in the side of the slot.

If the entire outer surface of the tool is left in the rough until after welding and then a finish cut is taken, it will be difficult to distinguish between a tool made in this manner and one made by broaching. All sizes of square holes can be made in boring bars, fly cutter heads, lathe tool holders, multiple tooth milling and facing cutters, etc., by using this method.

Constructing a Set of Socket Wrenches

BY D. E. McDONALD

A set of practical wrenches can be constructed in the shop by using socket head screws of various sizes. Block *A* is machined to the shape shown in the draw-



A set of socket wrenches can be made in the shop by using socket head screws of various sizes

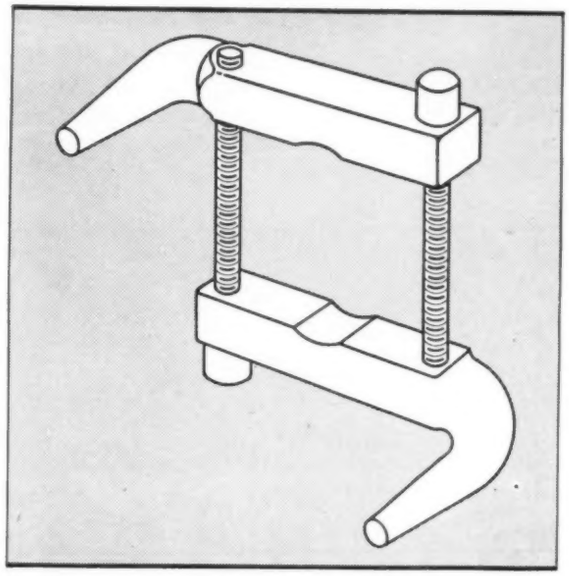
ing. The radius on the front of this block is made equal to the radius of the outside diameter head. Each block is drilled, so that the threaded portion of the socket head screw can be slipped through it. This hole is chamfered 45 deg. opposite the socket for a weld. The screw is cut off to a length equal to the thickness of Block *A*. The socket head screw is slipped into place and welded. The surface is then dressed off smooth.

A hole is drilled and reamed in the end of a head to fit the wrench handle. The end of the handle is turned to form a sliding fit in the head. A fine knurl is supplied to the handle.

Balanced Clamp Driving Dog

BY MARTIN H. BALL

The balanced clamp driving dog shown in the drawing was made primarily to maintain balance when machining parts with carbide tools. The use of a



A driving dog of this type in which all parts are balanced diametrically by a similar part is suitable for driving accurate work at high speeds

standard driving dog at such high speeds sets up sufficient vibration, because of the lack of balance, to make an accurately finished surface difficult to obtain.

The two tails are used in order to obtain a running balance. They also afford a means of double driving, but due to the fact that the driving slots in faceplates are usually just cored holes, and consequently not exactly true; and since the driving dog is not always placed absolutely concentric, only one of the tails is often in contact with the work.

In cases in which the tailstock is offset to secure a taper, the driving tail slides slightly in its contact with the faceplate. In such instances one of the tails may lose its contact with the faceplate while the opposite tail finds its bearing in its slot. In such an event, no harm is done as the change of speed is so small and gradual that it cannot be noticed.

The adjusting screws are placed in opposite directions, as are all parts of the dog, so that regardless of the size the dog is adjusted to, each piece has its mate diametrically opposite.

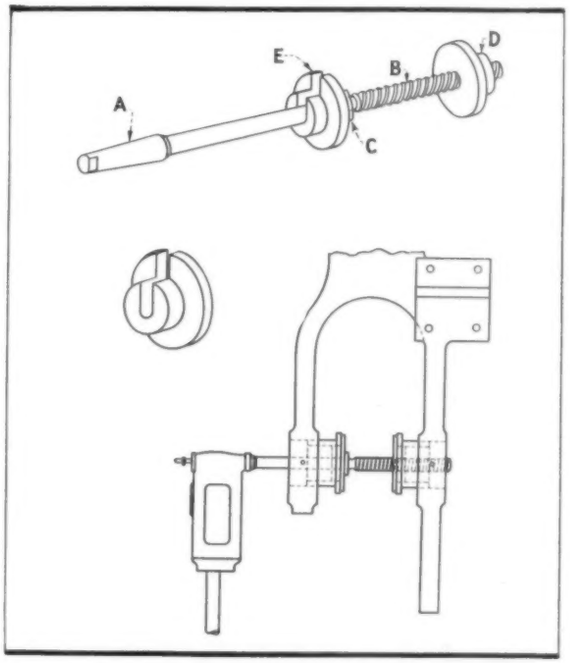
The work-holding notch for centering is made with less depth than usual, and the adjusting screws are placed as close together as the capacity of the dog will permit, thus adding to the sturdiness.

Tool Sets Brass Bushings

BY H. W. STOWELL

The majority of locomotives are equipped with Walschaert valve gear and two brass bushings in the link support that have collars to take the lateral wear of the link trunnions. These bushings must be pressed in from opposite directions, and the construction of the parts is such that there is no clearance for using a jack or sledge.

It has been the practice to draw these bushings in place with a bolt and hand wrench, one at a time. A tool that is an improvement over this method is shown in the drawing. Using an ordinary flat-type air motor, it forces two bushings into place at one time. The tool has tapered shank *A* at one end of the bar which fits the air motor. The other end has square thread *B* extending back into a point several inches from the end. Collar *C* which is integral with the bar is small enough so that it will slip through the brass bushings which are to be drawn in place. Collar *D* is



A slow hand method of setting two brass bushings in a link support can be replaced by this motor-driven bar which forces both bushings into place at the same time

threaded to fit the bar and collar *E* is split so that it can be slipped over the bar against integral collar *C* after the bar has been placed in position and screwed into collar *D*.

In use, the bushings are put in position to be drawn into place and the bar is slipped through them. Collar *D* is screwed onto the bar far enough to allow collar *E* to be slipped over the bar between the integral collar and the bushing on that side. The small diameter of the two collars fits into the bushings and the large diameter fits against the ends of the bushings. The air motor is started and the revolving bar forces the collars apart and draws the bushings into place. This action will tend to spread the two members of the link support apart and if these parts are of light construction they can be braced by a suitable bolt or by a chain and wedge.

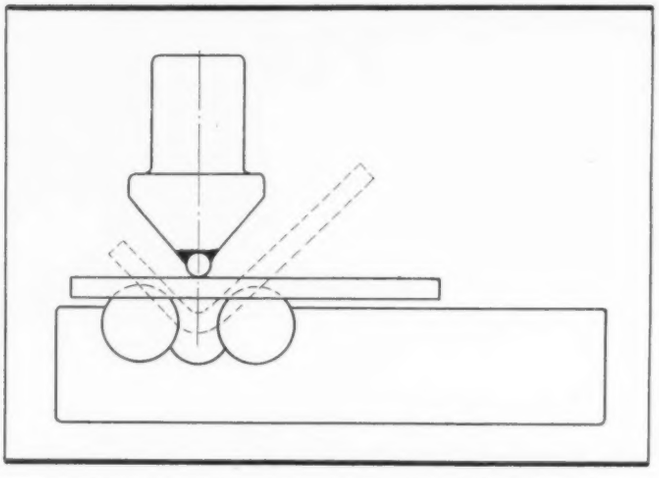
If the parts are properly braced it will be possible to apply considerable force to push the bushings into place without damaging the valve gear, and with a saving in time over the old method of seating them separately.

Simple Bending Punch and Die

BY MURRELL KAUTZ

The bending punch and die shown in the drawing has been very successful in operation. It is used in a crank type punch press and was designed to bend $\frac{1}{4} \times \frac{3}{4}$ in. cold finished flats without marring the finish.

The punch is made of mild steel with a shank to fit the punch press and has a tapered end to which a drill rod is welded. The die is a cold finished square or flat of suitable size with cylindrical slots to fit two rods. These are also made of cold finished steel and have flats on them which have been milled the length of the rods and then carburized. The drill rod on the punch is parallel to these rods and drops between them. The radius of the drill rod is equal to the inside radius desired on the work to be bent.



This simple punch and die are useful for bending in a crank press. The solid lines indicate the work before bending while the broken lines show the position after bending

The work is laid across the milled flats on the rods set in the die and the bending operation is performed by striking with the punch. As the work is bent the die rods revolve in the cylindrical slots so that the work is always resting on the milled flats.

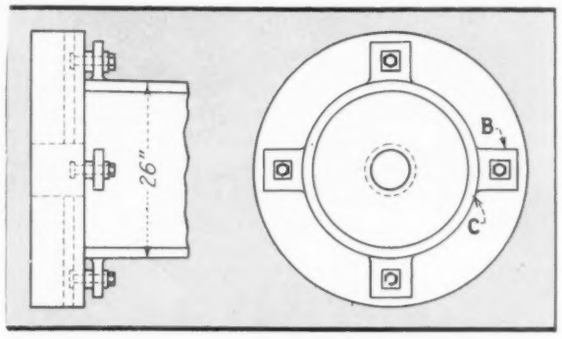
This bending punch and die combination are simple to manufacture in whatever size is desired.

Welded Supports for Large Tubes

BY ARTHUR SILVESTER

Recently we had a quantity of tubular shaped pieces to machine. The outside diameter of the finished piece was 26 in., and the inside diameter was 25 in., so that the finished piece would be $\frac{1}{2}$-in. thick after machining. The tubing was cut off in about 20-in. lengths and was to be 18 in. when finished. Since the finished work had to be within 0.003 in. of round inside and out, it would have been difficult to hold the work in either a four- or three-jaw chuck.

To properly hold the work in such a chuck would take much longer than with a thicker tube and the jaws would tend to push the tube out of round so that it would be difficult to hold the machining within the tolerances that were specified.

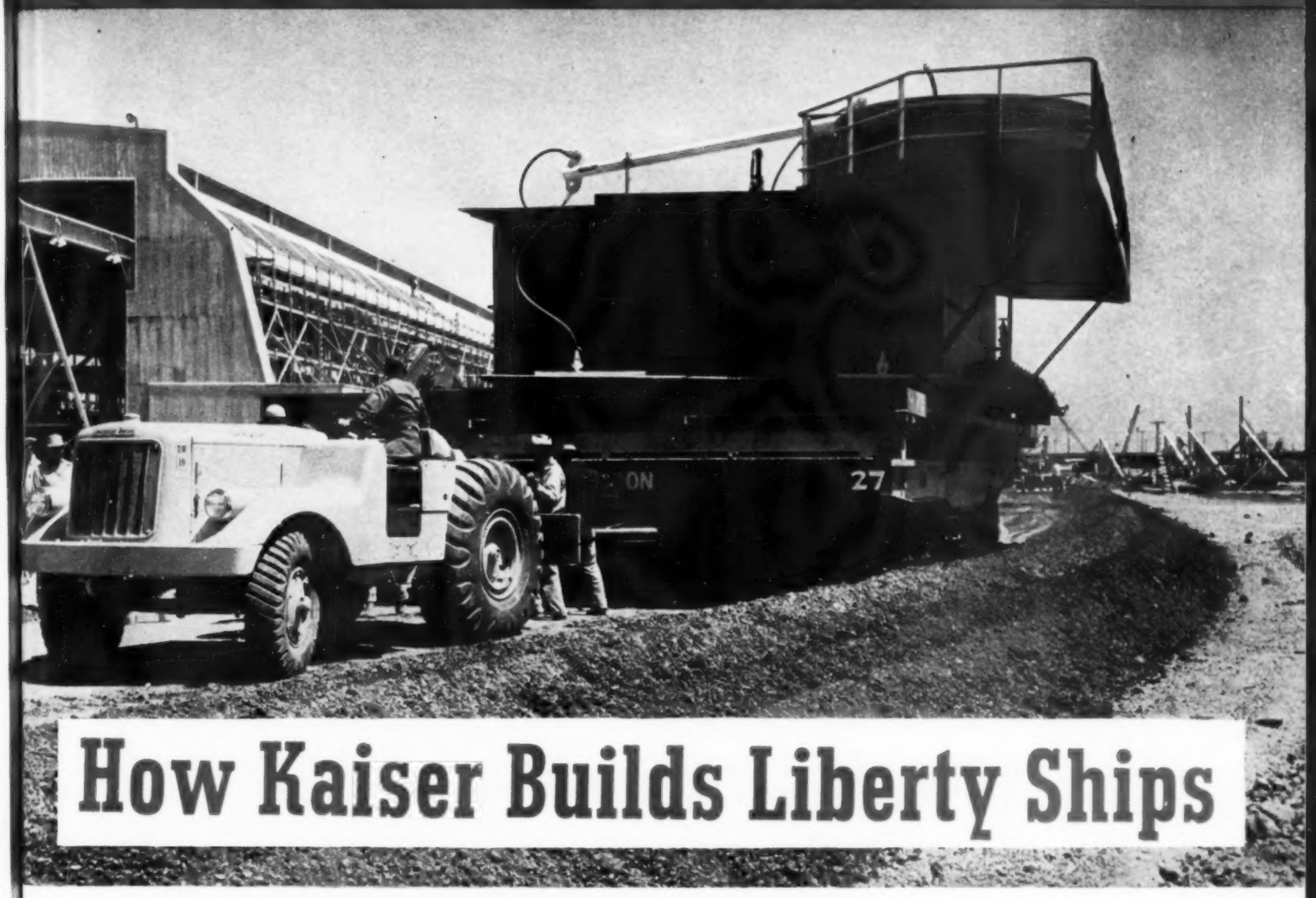


Four pieces of flat steel welded to one end of a large tube hold it against the faceplate for accurate machining

Four pieces of steel were welded like feet to one end of the tube and then used to clamp the tube to the faceplate. Pieces of flat finished steel $4 \times 3 \times \frac{1}{2}$ in. were used. These were clamped to the faceplate of the lathe and bored to the same diameter as the outside diameter of the rough tube. They were raised from the faceplate by inserting pieces of steel behind them to allow more room when boring the tube. With the tube and flat pieces of steel set up square, they were welded together. The tube was then clamped to the faceplate and machined inside and out. It proved to be within 0.002 in. of round. The clamping pieces were used over and over again by heating and removing from the finished piece and then welding to the next piece.

Armament

SECTION OF AMERICAN MACHINIST



How Kaiser Builds Liberty Ships

An after deck house on its way to the ship is carried by a mammoth trailer

Production methods that have made ship-building history are exemplified in the line assembly of deck houses at the Richmond Shipyards, a Kaiser company

FOR THE FIRST TIME on a large scale, assembly line methods are being used in the prefabrication of major units to be incorporated in ships.

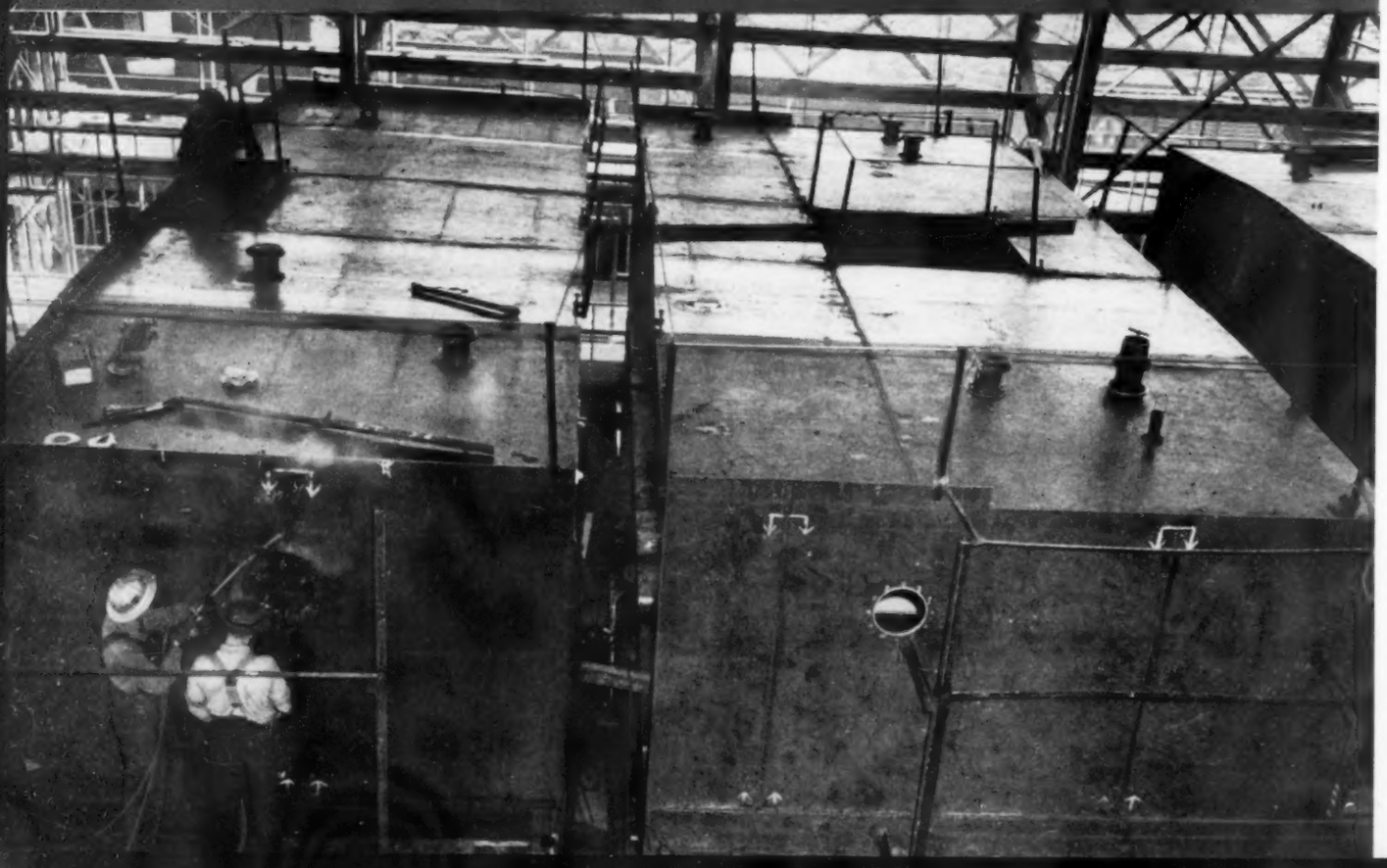
The development has taken place at Richmond Shipyards 1 and 2, Richmond, Calif., which are operated by the Henry J. Kaiser interests. Here EC-2 cargo vessels of 10,500 tons capacity popularly known as Liberty Ships, are being constructed. At present the midships and after deck houses are being built under the production line principle.

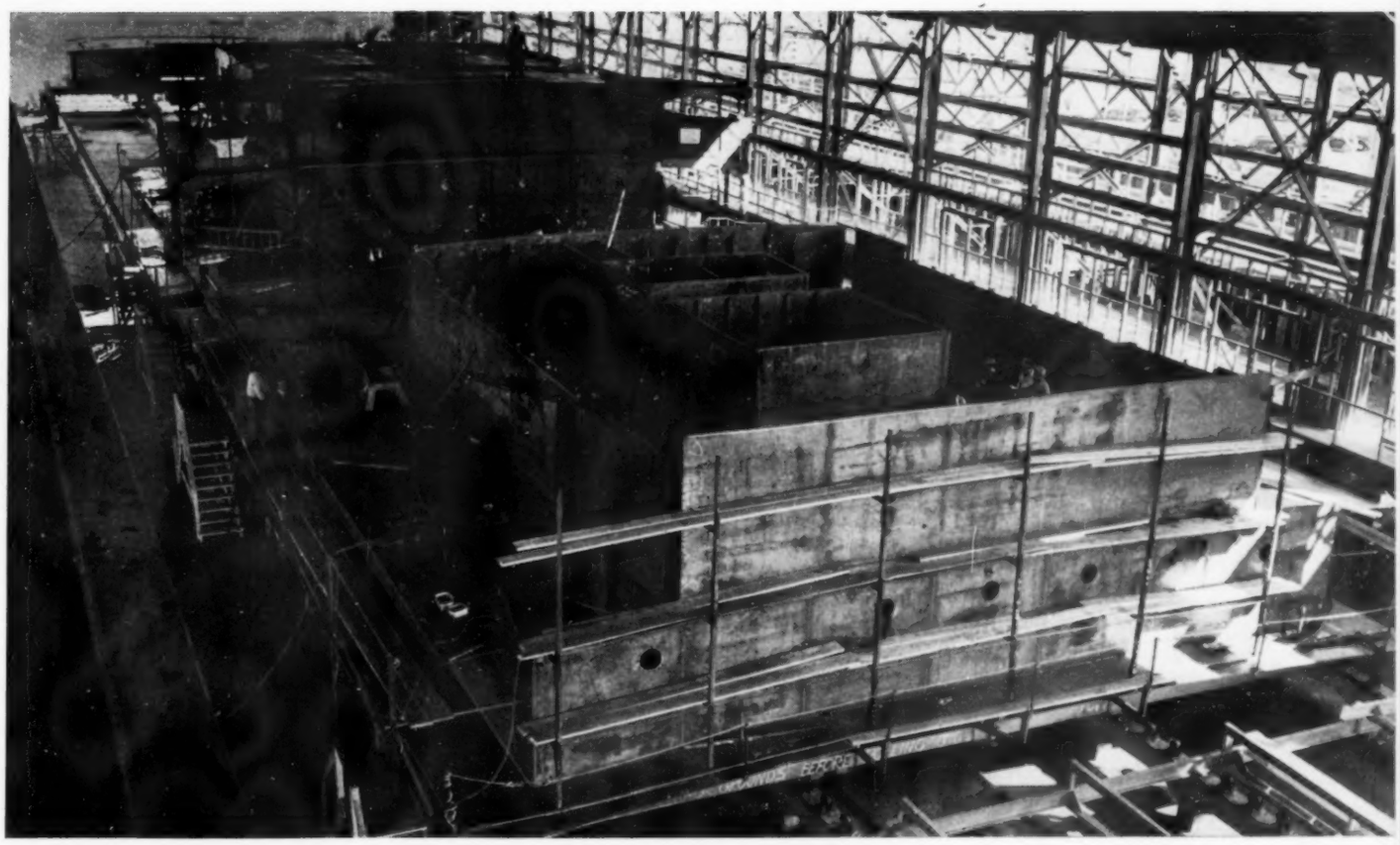
One of the major problems in normal shipbuilding is found in the great many tasks which must be undertaken simultaneously while the ship is taking shape, plate by plate, on the ways. Under the old method, while the hull is nearing completion and such structures as the deck houses are being added, it is necessary to have a great many workmen of the various

HOW KAISER BUILDS LIBERTY SHIPS

Three sections of the midships deck house roll through the shop on a conveyor — Section C in the foreground, Section B in the middle and Section A in the background

Built in the prefabricating shop, the four midships deck house sections are transported to shipside before they are assembled and welded together





A true line assembly operation is the fabrication of deck houses carried down the shop on traveling jigs

crafts on the job. Typically, stumbling over one another will be welders, cutters, pipefitters, burners, joiners, plumbers and electricians. Under such conditions it is, of course, extremely difficult to achieve any semblance of efficient production, and as a consequence the building of ships traditionally has been slow in its late stages.

The only previous approach to an assembly line in shipbuilding has been at Oregon Shipbuilding Corporation's yard at Portland, likewise operated by the Kaiser interests. Here the idea has been used in construction of the deck houses.

It was this yard that, as of August 1, set the U. S. Maritime Commission record for building the most ships per way and a ship in the shortest time, in the emergency cargo ship program. The Oregon yard delivered 54 ships from eleven ways since the start of the program, an average of 4.909 ships per way with an average construction time of 108 days. Present production greatly exceeds these figures.

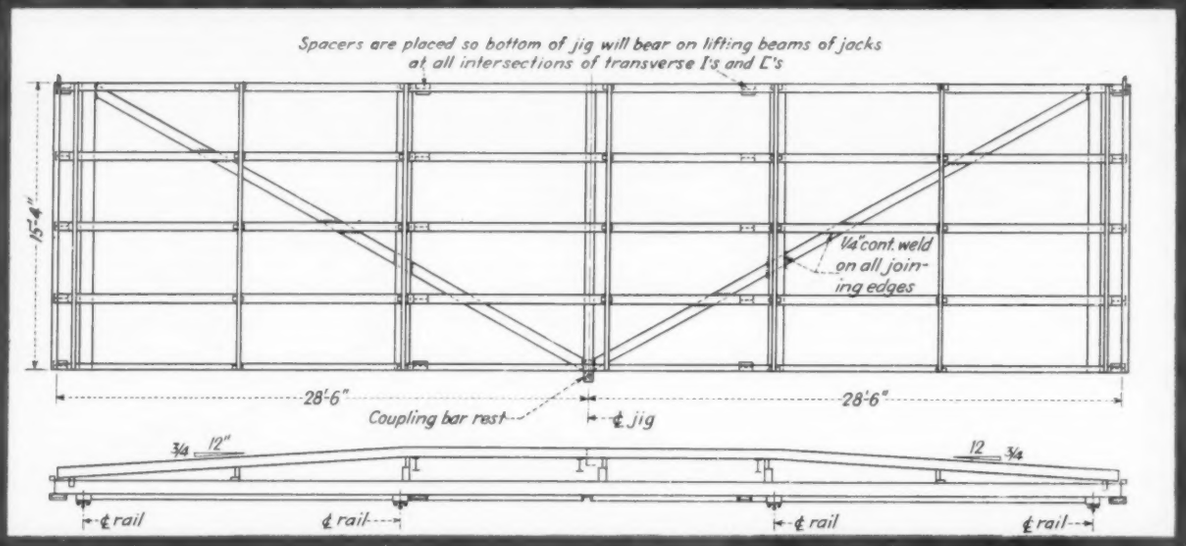
Richmond Shipyards Nos. 1 and 2 had an average production time of 113 days per ship, taking second place. Unquestionably the use of the assembly line methods was responsible in part for the production rate at both the Oregon and California yards. Significance of the record in the nation's war effort is indicated by the production figures turned in by other yards. Third best average time for building a Liberty ship was 139 days (Bethlehem-Fairfield Shipyard, Inc., Baltimore), while the maximum average time was 276 days.

The structures being built on the Richard Yards' giant conveyor lines are the midships deck house and the after deck house. The midships deck house is built in four sections, which are welded together when they are placed in the ship, while the after deck house is constructed as an integral unit. The midships structure is split up for convenience in handling.

A Large Steel Structure

The midships deck house is three stories high. Specifically, its dimensions are 24 ft. high, 60 ft. wide, and 75 ft. long. Each section into which the midships deck house is cut varies, but an average would be 20 ft. long. The heaviest section is about 72 tons, and the lightest about 45 tons. The after deck house is about 45 ft. wide, 30 ft. long, and 7½ ft. high. The latter dimension is to the house top.

Plate and structural shapes which go into the deck house assemblies are shipped from the various supplying mills direct to the shipyard warehouses, and then are re-handled to the prefabrication area either by railroad flatcar or by truck and trailer. They are handled in the prefabrication yard by truck cranes of



assorted manufacture—just about whatever could be purchased on the war-time market.

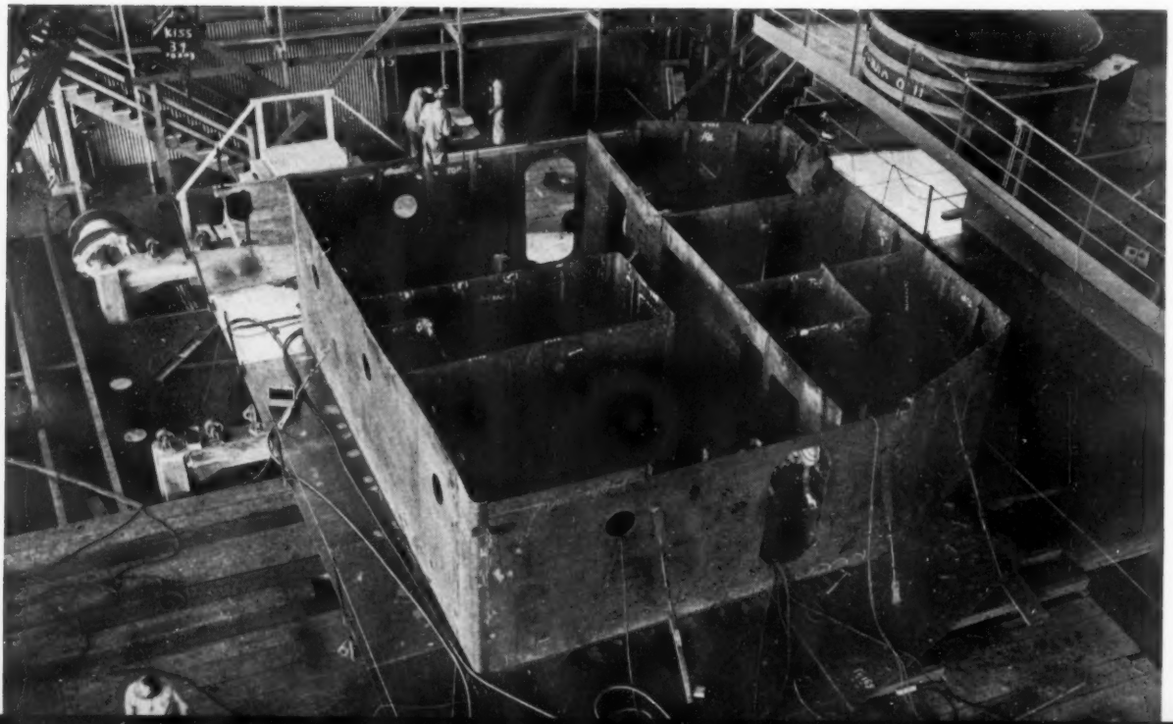
Prefabrication facilities consist of the following: The assembly plant, raw steel storage area, bulkhead layout tables, bulkhead storage racks, the "angle orchard", where fabricated stiffeners, headers, girders, and similar shapes, ready to be installed, are stored; the bending press area, where the shapes are fabricated; the acetylene house; the layout area for deck sections; and the "upside down" layout area. The latter two departments are located at the east end of the assembly plant, and are covered by the bridge cranes which serve the plant proper. The crane runways have been extended 150 ft. in the open to cover this area.

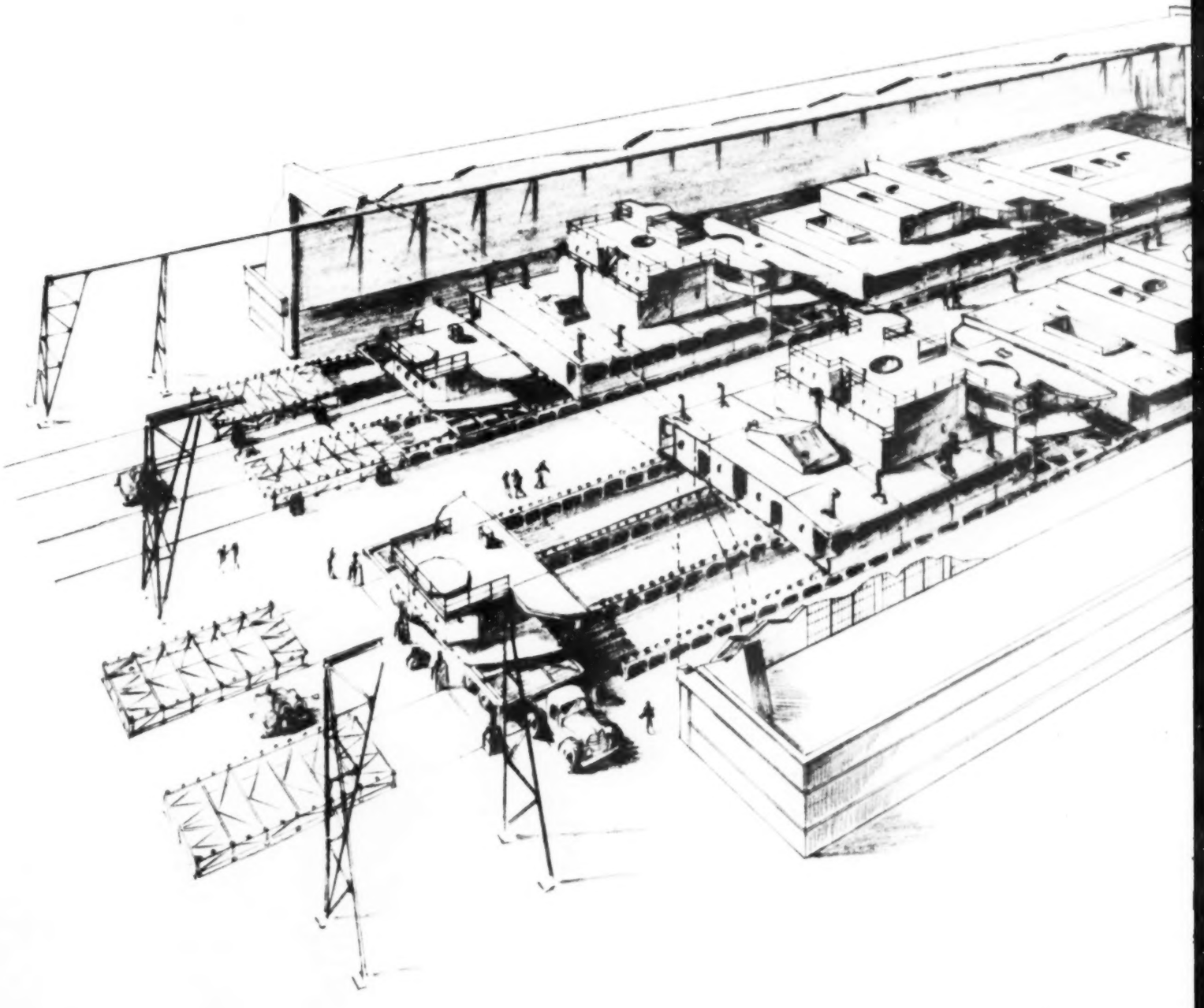
The working area of the shop proper is 480 ft. long and comprises two 90-ft. wide bays. There are three bridge cranes in each bay, in capacities of 10 and 20 tons. These cranes cover an open space extending 150 ft. at the east end, as mentioned, and 75 ft. at the west end. Vertical clearance below the cranes is 40 ft. The shop has a structural steel frame and is sheathed with metal. Offices and such departments as joining, pipefitting, electrical, and sheet metal are located in 36-ft.-wide areas running longitudinally along the working areas.

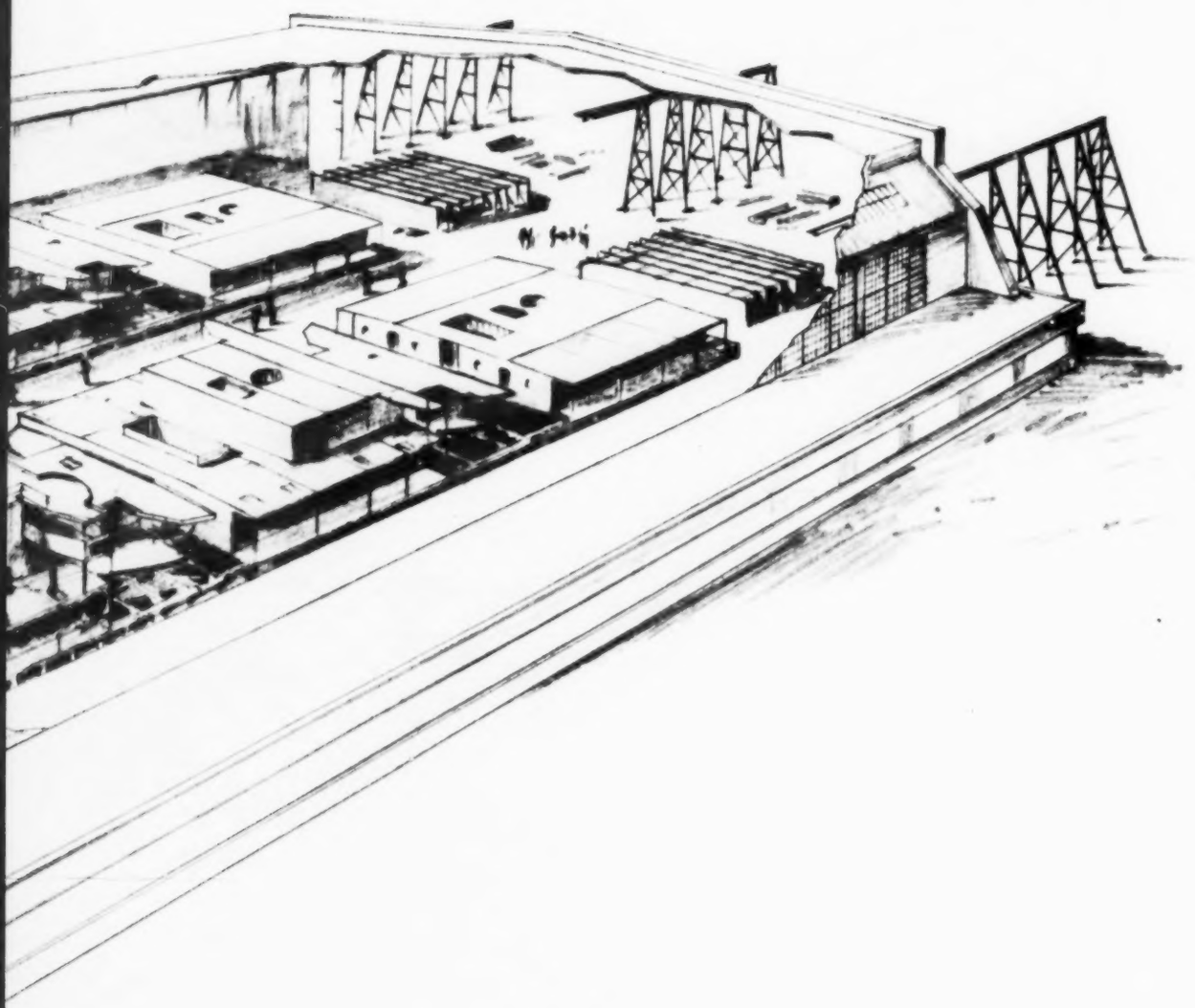
There is one conveyor line in each bay. Each line is capable of carrying three complete deckhouses at the same time, giving the plant a capacity of six deckhouses. The conveyor lines consist of concrete foundations 3 ft. high, on which are mounted trolley wheels at 2 ft. intervals. On these wheels ride the jigs which carry the deck houses. The foundations are on 17- and 20-ft. centers, and run the complete length of the shop. Space between the two lines is 37 ft. 4 in.

Connecting with the conveyor lines, at the west end of the plant, are tracks 80 ft. long which carry

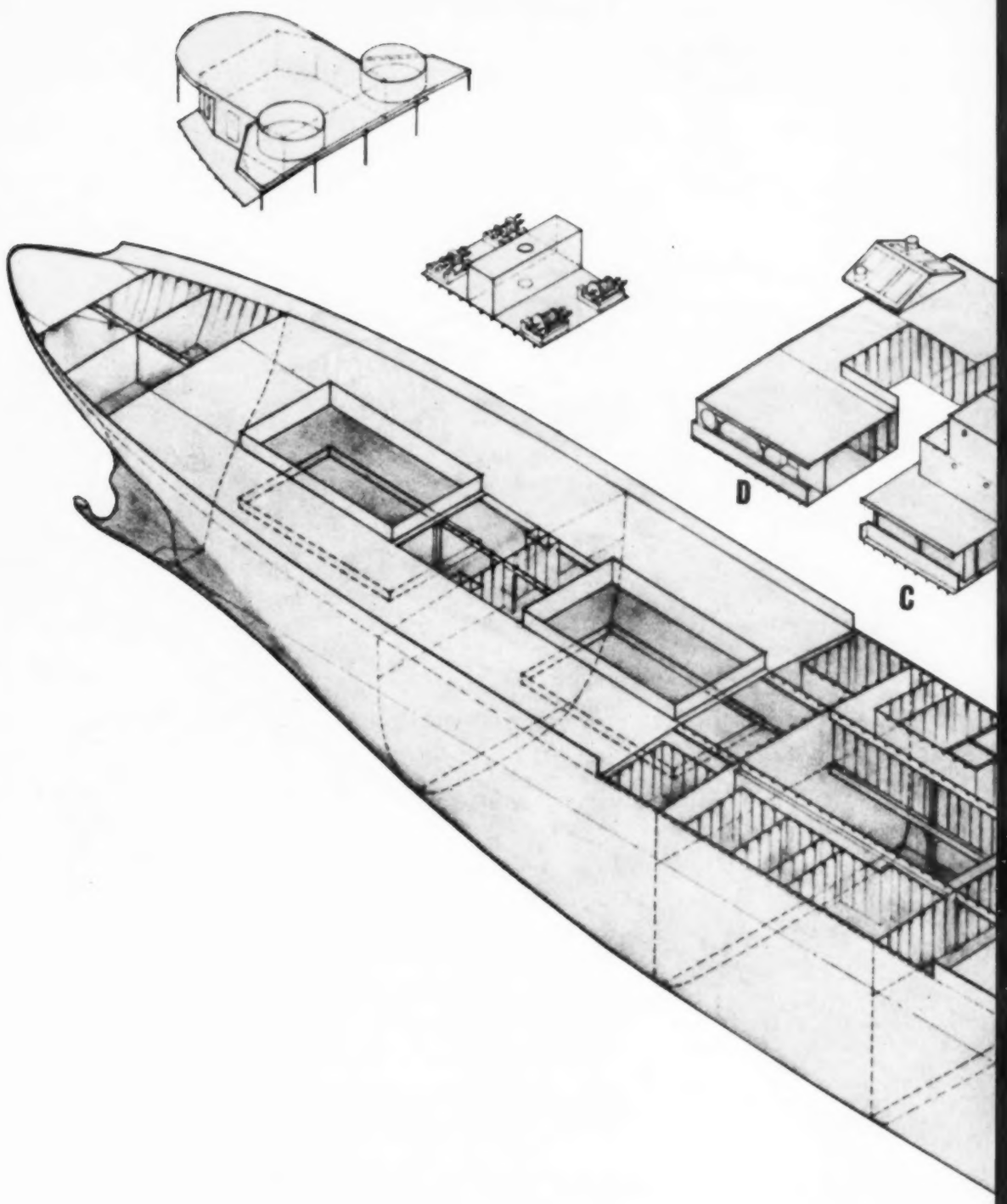
Smaller in size, the after deck house in the foreground goes down the prefabricating line and is transferred to shipside in a single section



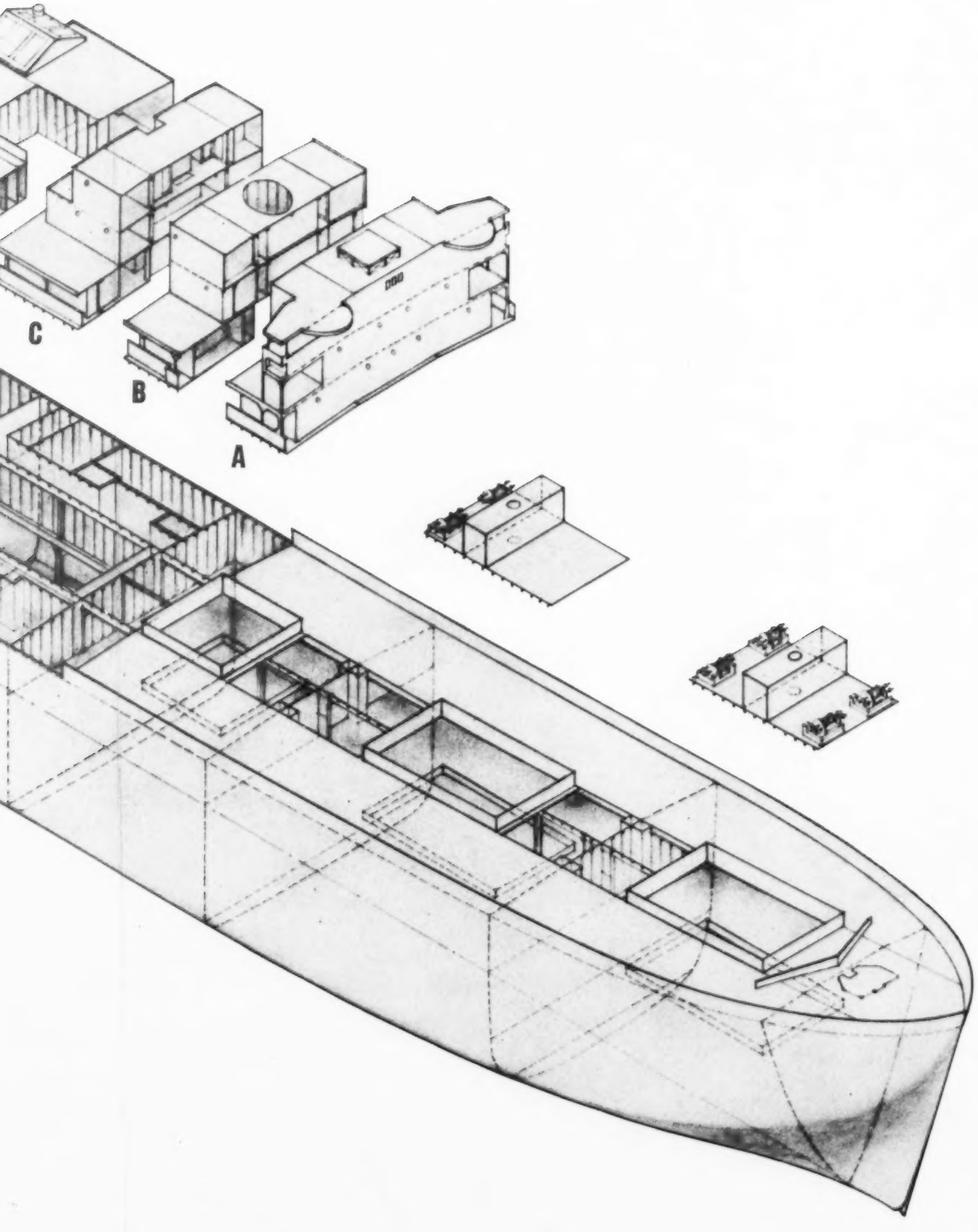




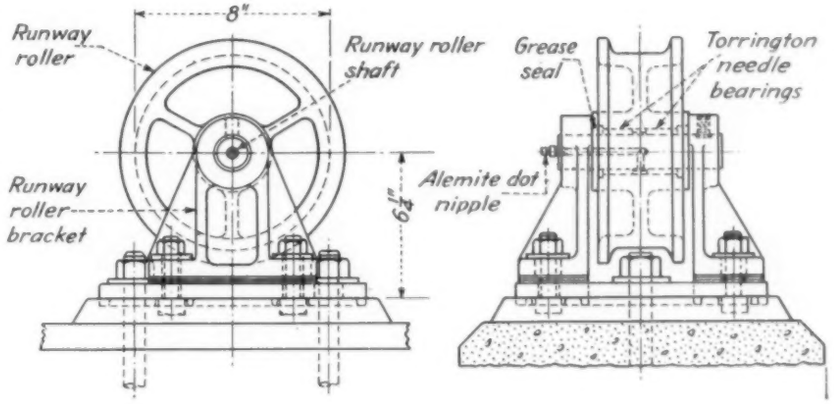
The Richmond deck house prefabricating shop has twin assembly lines each of which carries superstructures for three ships at one time



Prefabricated deck structures, including the houses described in the article, are shown in this perspective view of a 10,500-ton Liberty ship


C
B
A

Deck-house sections are built on a welded jig, ruggedly designed to carry its heavy load



Roller units support the deck house jig as it moves through the prefabricating plant

40-ft.-long retractable conveyor sections. These sections are identical with the lines in the plant, with the exception that they are mounted on steel frames with wheels which enables them to be moved out of the way when not in use.

The conveyor wheels are constructed of Meehanite Class GA metal. Wheel diameter, from the outer periphery of the rim, is 9¼ in., while the actual bearing surface has an 8-in. diameter. The wheel rim width is 3½ in., and the rolling surface width is 1⅞ in. Shaft diameter is 1.51 in. Roller bearings are used.

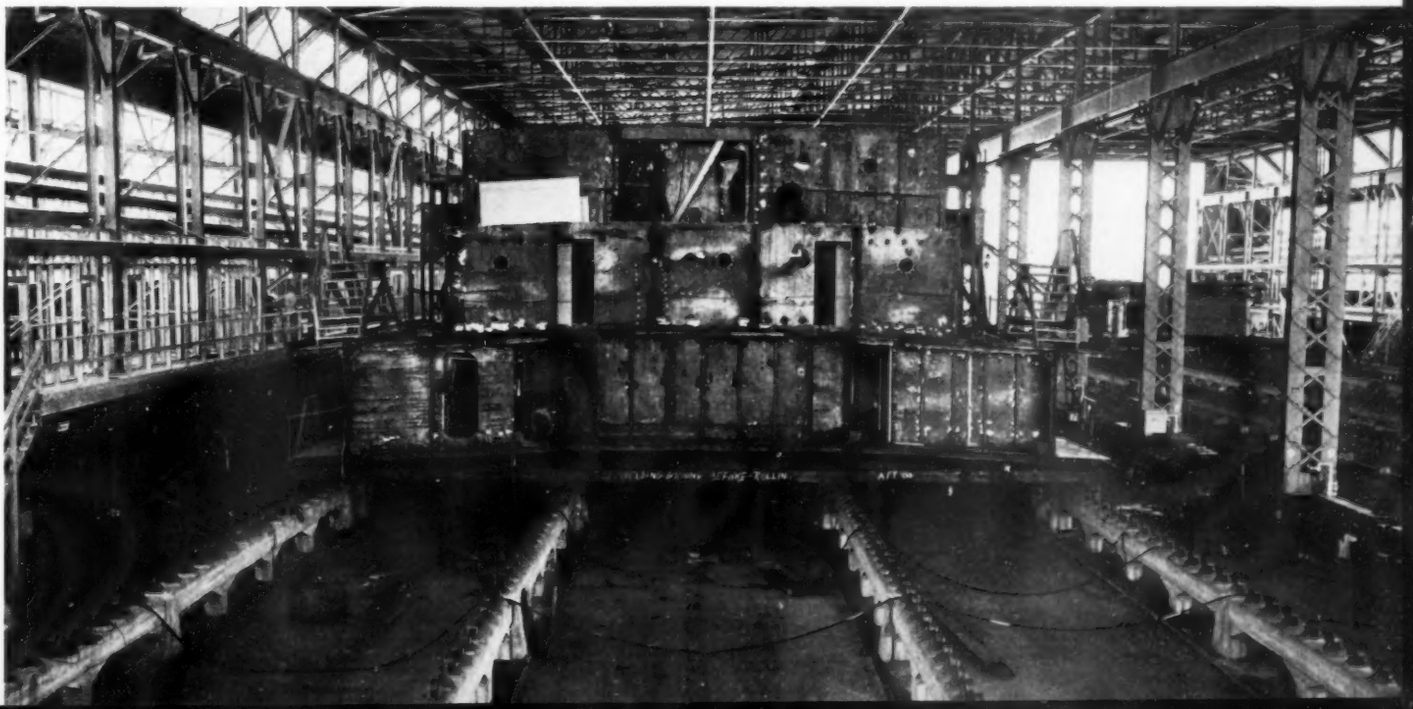
The first step in building the deck house is in construction of the upper deck section, which begins in the deck layout area at the east end of the plant. Here they are laid out, double torched and match marked for fit. About 36 plates will normally form the upper deck. They will average about 7 by 15 ft., and maximum size is approximately 7 by 30 ft. Plate ¾ in. thick is used.

After having been laid out and cut, the plates are transferred to the "upside down" jig. This structure conforms to the dimensions and camber (¾ in. to the foot) the deck will assume. The plates are laid out on this jig and welded together. Two Union-Melt welding machines are employed at this point, as well as batteries of Lincoln 300-amp. welders.

Next, the beams, stiffeners and other shapes are welded to the deck assembly. These structural shapes are secured from the "angle orchard", located east of the prefabrication shop. The job of cutting and bending them to shape goes on continuously, so there is a large inventory ahead of actual fabrication, and no time is lost when they are needed. A 12-ft. power brake is used for this work. Eight feet of this unit is equipped with dies for 3 in. radius bends, and the other four feet for 90-deg. knuckles for forming brackets.

Up to this point, the deck section has been laid out,

Part of the secret of the deck-house assembly line is the method of support. Rigid jigs mounted on four rows of rollers carry the structures along



cut and welded in an upside-down position. Now it is picked up and turned over by the bridge cranes. Midships deckhouse decks are placed on a series of four jigs, one for each of the sections into which it will subsequently be cut. After deckhouse decks are placed on a single jig. These jigs are merely platforms constructed of beams conforming to the shape of finished deck, and are similar to the "upside-down" jigs.

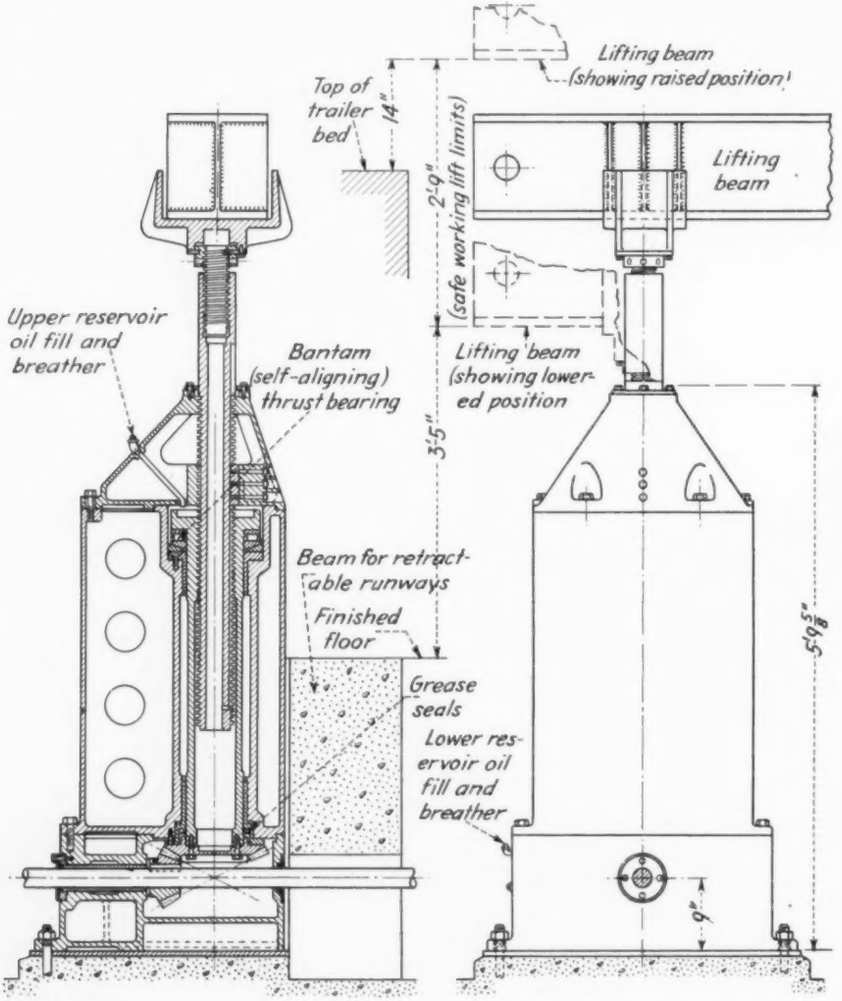
As with the structural shapes, bulkheads are fabricated ahead of time and are stored in racks adjacent to the shop pending their use. Inventory of all raw material, shapes and subassemblies such as the bulkheads is kept with an efficient production control system which employs a visual graph method showing the status of each component of the deck houses.

As each jig carrying its respective section progresses along the line, additional bulkheads, boat deck, bridge deck, house top, mechanical installations such as piping, plumbing and heating; and electrical and joiner work, are added successively. The jigs are pulled along the assembly line by cables from an American two-drum, 10-hp. hoist at the west end of the plant.

As each unit is completed, temporary stiffeners and much of the rigging to be used later in hoisting the assembly into position on the ship are added. When the deck house reaches the end of the conveyor line, it is complete to the last detail. The only work remaining after it is placed on the hull is welding the deck into place, and welding each of the four sections of the midships deck house together. The after deck house is complete and requires only welding in place.

As soon as each unit is completed, the retractable conveyor section is rolled up and locked to the end of the plant conveyor line, and the deck house unit is rolled onto it. The jig is spotted at predetermined points over a series of eight jacks, each of which is actuated simultaneously from a common shaft by a 20-hp. electric motor.

Each jack has a bevel pinion keyed to the shaft which meshes with a gear integral with a vertical sleeve. The upper part of the sleeve is threaded internally to form the jack nut. The outer section widens into a flange which rides on a roller thrust bearing. The elevating screw which engages the nut



Electrically operated jacks transfer the deck-house sections from the assembly line to a trailer which takes them to the shipways

Section D of the midships deck house has been rolled onto the retractable conveyor section and jacked up for a trailer. Lifting jacks have been installed to replace the blocking in the illustration

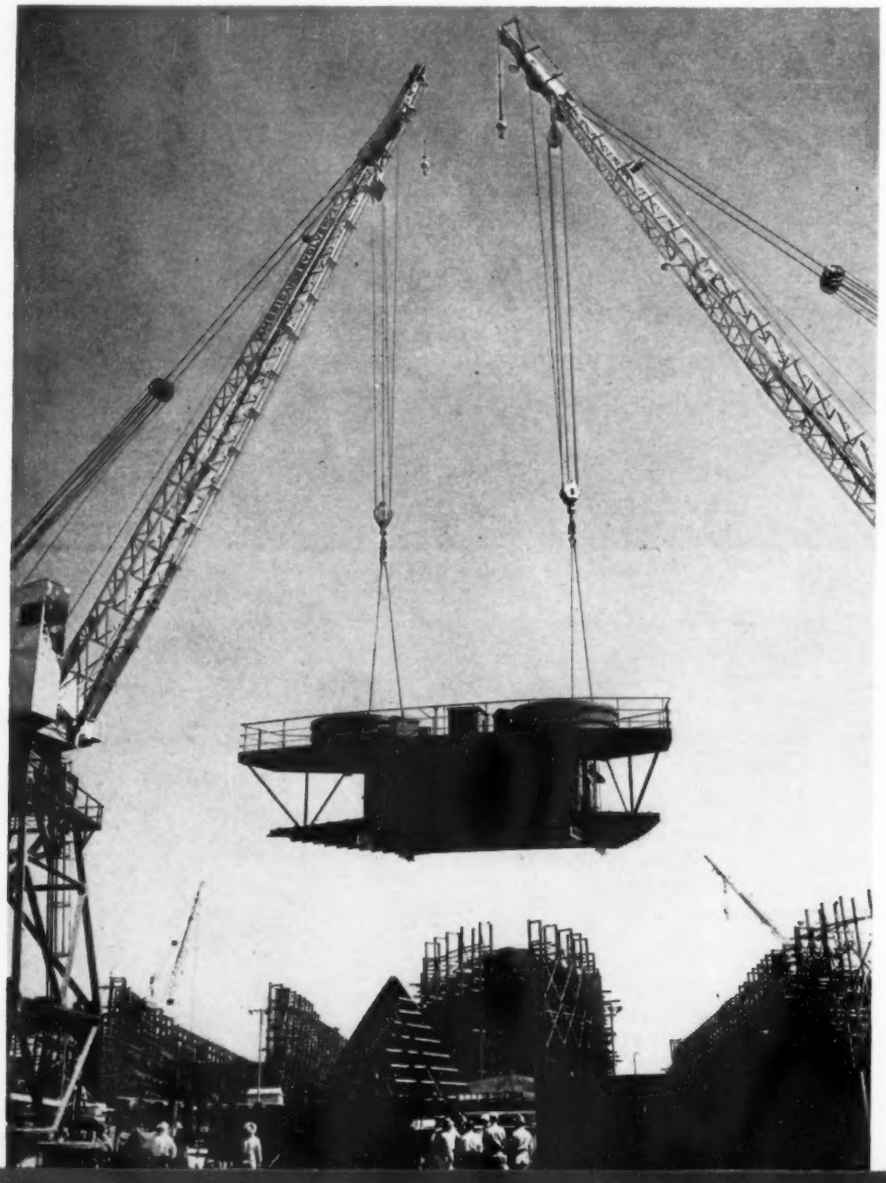
A Caterpillar tractor and its trailer are backed up to receive the completed after deck house

is splined to the jack housing to keep it from rotating.

The jacks are elevated until they are about $\frac{1}{4}$-in. from the point of contact on the jig, then stopped. The final gap is taken up by a manually operated threading mechanism. This provision has been incorporated in the design to prevent any racking or straining of the jigs and deck-house unit which might be caused by inequalities in the jig or the jacks.

With the unit elevated, the retractable conveyor section is rolled back, and a special trailer backed in underneath the jig. This unit is an 85-ton Trailermobile, equipped with thirty-two 10:00x15 tires. It is approximately 21 ft. wide by 60 ft. long. A Caterpillar DW10 wheel type tractor is used to pull the trailer to the ways, where two ship cranes are used to set it in place.

The prefabrication shop is staffed with approximately 2,500 workers. Due to a shortage in manpower, women have been trained in recent months as burners and welders. In early August, there were 14 women welders and 28 women burners. The company has found that they do their work quite capably, and in some instances are superior to the average male worker.



Two cranes lift the midships deck house onto one of the cargo ships

Low-Cost Dies For Aircraft Parts

By BENHARDT SCHLENZIG
Naval Aircraft Factory

FORMING AND BENDING DIES made of plastic and semi-plastic materials can be used for a large percentage of the sheet-metal parts employed in airplane construction, particularly those made of aluminum and magnesium alloys. There are some cases where steel dies must be used for making aircarft parts. In many cases, however, non-metal die materials can be substituted for steel and other metal die materials that are considered critical at the present time.

The use of dies made of non-critical materials within the Naval Aircraft Factory has been extended rapidly in recent months as a result of the insistence on the part of the management that a substitute for critical metals, so badly needed for the building of ships, be found and used wherever possible in the manufacture of forming dies and other tools. Further, the use of such dies has resulted in major savings in the time required to complete a tooling program. Not only can these non-metal dies be made in less time than can steel dies, but operations on dies parts often can be carried out on high-speed wood-working machines and so relieve the load on the metal-working machines in the toolroom. Also, such dies are lighter and easier to handle in the shop than are steel dies for the same parts. Masonite die stock, for example, weighs only one-sixth as much as steel. It is seldom that a hoist is needed to lift one of these forming or blanking dies into or out of the press.

The dies employed in the aircraft industry for forming sheet aluminum-alloy parts do not need the same durability as those used in the automotive industry to form sheet steel parts. Due to the stability of automobile design, a die employed in that industry often is called on to make in excess of 100,000 parts. In the aircraft industry, on the other hand, it is seldom that a forming die is called on to produce 5,000 parts before it becomes obsolete. Often the quantity required is much less. Non-metal dies, which require much less time to make and have a lower cost, frequently have a useful life in excess of that required for a high percentage of aircraft parts. Further, the sheet aluminum alloy from which these parts are formed has a protective coating of pure aluminum. This coating is easily damaged in steel dies, but is protected by the non-galling surface of the semi-plastic die. Another advantage of semi-plastic dies is the fact that their cost is so low that it is economical to make

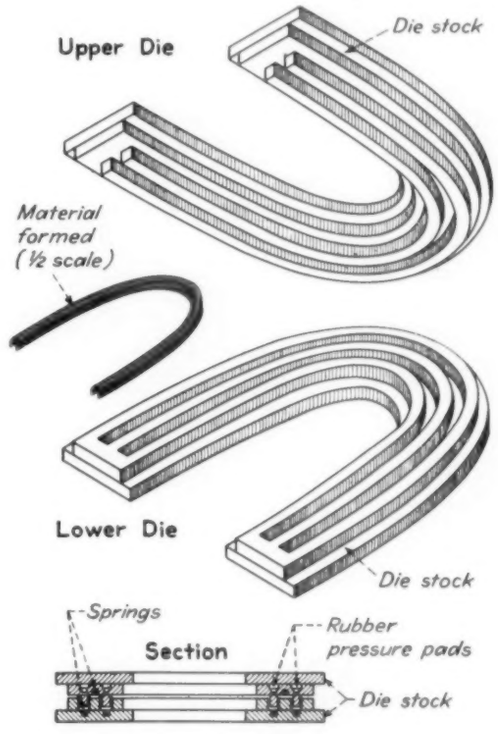


Fig. 1—Semi-plastic die materials, such as Masonite die stock and Bakelite, are being used in the construction of a large number of mating dies at the Naval Aircraft Factory in order to reduce the amount of tool steel needed to a bare minimum. In addition, tool cost is reduced and much time is saved. This channel forming die is typical of many of those now in frequent use

dies for parts of which only a few pieces are required.

An important development in the use of plastic and semi-plastic materials in the construction of blanking and forming dies at the Naval Aircraft Factory has been in the manufacture of mating dies for use in single-action mechanical presses as well as hydraulic presses. This development not only has reduced the time required to tool up for many of the parts, but has reduced materially the amount of steel required for the construction of tools. In addition, these die materials are employed for the forming, blanking, and combination blank-and-form dies for hydro-press operations with rubber platens with which all aircraft plants are familiar.

Mating Dies Used for Channels

Aluminum-alloy channels with either or both flanges extending from the center web in closed, open or straight 90-deg. bevels are formed in semi-plastic mating dies like that shown in Fig. 1 from sheet stock up to 0.125 in. thick. In this die the metal is flowed and set over the forming edges of the lower die member. Phenolic fiber (Bakelite) or steel facings are fitted to the working surfaces of the lower die where production requirements are high. Ordinarily, no facing material is fitted to the Masonite semi-plastic die stock material when production requirements are 500 pieces or less. A $\frac{3}{8}$-in. thick facing of Bakelite generally is used on dies where production runs of up to 2,000 pieces are necessary and die wear must be held to a minimum. For larger quantities, $\frac{1}{8}$ to $\frac{1}{4}$ in. thick steel facings are employed. These are highly polished and usually are hard chromium plated, especially when Alclad aluminum-alloy sheet is to be formed.

The steel die springs used in the lower die member are of standard size and are readily removed when the die is placed in storage. Thus springs for such dies can be kept in a box at the press and inserted when the die is set up. A minimum number of springs need be stocked when this practice is followed. Each die is stamped with the size and length of standard springs required, and it is a matter of only a few minutes time to insert the springs and make it ready for use. Dies of this type can be completed in one or two days time from stock material, using high-speed woodworking tools of the type to be found in most pattern shops.

An improvement in this type of die has been developed and a patent has been applied for by the author, and mating dies of this improved type now are in use at the Naval Aircraft Factory for the formation, by drawing in a single operation, of channel section shapes in which one or both the flanges extend from the web at an acute or at an obtuse angle. These channels may be curved, straight or combined straight and curved, as is necessary for such items as ribs and stiffeners used in airplane construction. In addition,

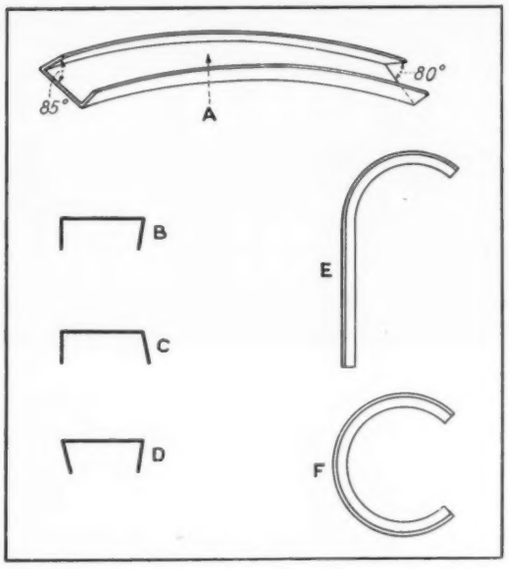


Fig. 2—These channel shapes are formed easily in one operation in Schlenzig-type forming dies which incorporate flexible members. Flanges may be formed at acute or obtuse angles with the channel web, whether the channels be straight, arcuate, or combined straight and arcuate, in longitudinal section

the channel sections may have flanges whose angular position in relation to the web is varied from one end to the other, as shown at *A* in Fig. 2. The cross-section shapes of these channels may have different combinations of flange angles as indicated at *B*, *C* and *D* in the same sketch, while the parts may have wide variation in form as indicated at *A*, *E* and *F*. Important features of these improved dies are flexible die members so mounted on their base that they may adjust their position on the base as the die is closed and these members are distorted from the original shape.

Sketches Show Design Details

In Figs. 3 and 4 are shown open and closed views of such a die arranged for forming a curved channel with one 90-deg. flange and one acute-angle flange. Plan views of the male and female die members of this set are shown in Fig. 5. Open and closed views of a die arranged for forming a similar channel with one 90-deg. flange and one obtuse-angle flange are shown in Figs. 6 and 7. Fig 8 is a view, partly in sec-

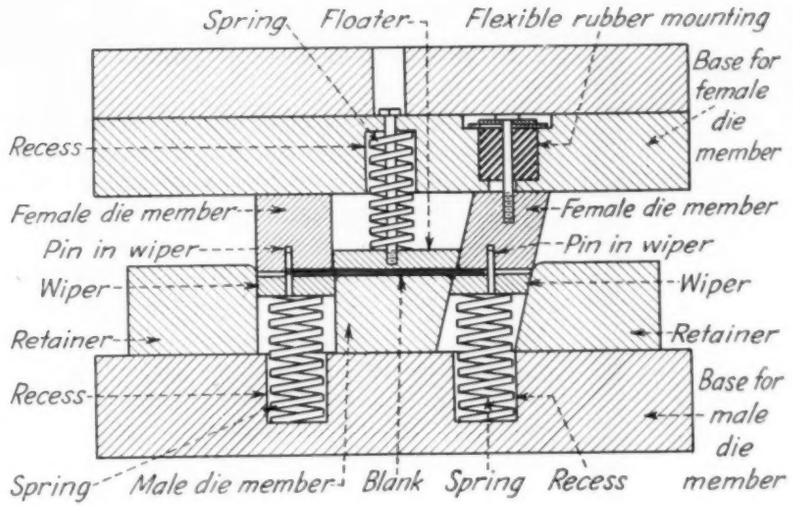


Fig. 3—Design principles of Schlenzig-type mating dies are illustrated in this section of a die designed to form an arcuate channel with one flange at a 90-deg. angle with the web and the opposite flange at an acute angle. All parts of this assembly, except the steel springs, pins and machine screws, and the rubber mountings, are constructed from semi-plastic materials

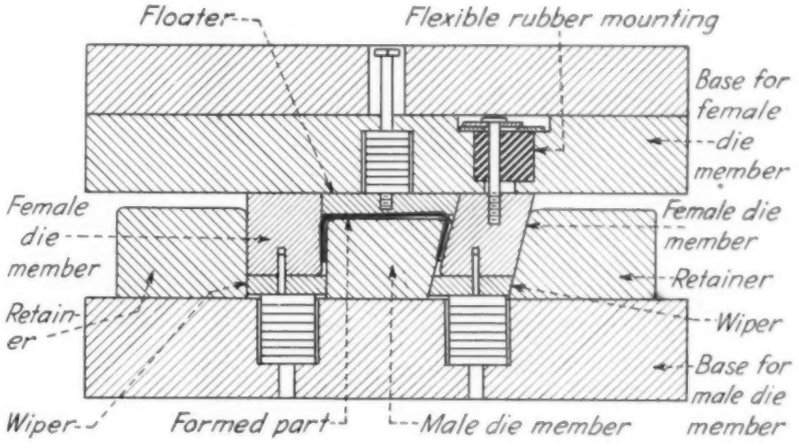


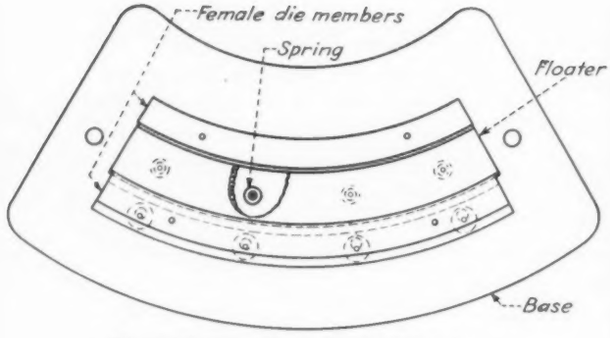
Fig. 4—This sketch shows the closed position of the die shown in open position in Fig. 3. Note that the right-hand female die section has been forced toward the left by pressure of this member against the right-hand retainer in the lower base. When the die is opened the wipers will be returned by the lower springs to strip the formed channel off the male die member

tion and partly diagrammatic, showing succeeding steps in the drawing operation of dies such as are shown in section in Figs. 6 and 7. These dies are most adaptable for use in shaping non-ferrous metals and alloys in sheet forms that are relatively soft compared with, for example, sheet steel. However, their use is not limited to these non-ferrous materials.

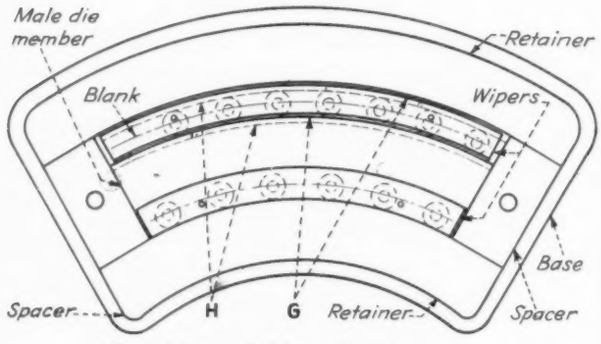
In Figs. 3 to 7 inclusive, it will be noted that the opposite faces *A*, *A*, of the male die member are of a height greater than that of the flanges to be formed. Each face is machined at an angle to the top surface equal to the angle required on the corresponding flange of the product to be formed. As shown in Figs. 3 and 6, one or both of the faces may extend at a right angle to the top surface, and either or both faces may extend inwardly at an acute angle or outwardly at an obtuse angle. The male member may be curved, as shown in Fig. 5, more or less circular, partly curved, or more or less circular and partly straight. The ends of the male die member abut against a pair of spacers, Fig. 5, which serve to locate the two retainers mounted on the base at either side of the male die member. Each retainer is spaced from the male die member a distance greater than the depth of the flanges of the product. In most cases the faces of the retainer members are desirably, though not necessarily, parallel to the opposite faces, respectively, of the male die member. The male die member, the two end spacers, and the two retainer members are mounted firmly on a base. These members may be made of plastic or semi-plastic materials, such as Masonite die stock or Bakelite, or may have a facing of steel if the production run is to be very high. The top surface of the male die member may be faced with Bakelite or polished steel.

Wipers Seated on Springs

In the spaces between the male die member and the retainer members are positioned wipers which are resiliently mounted on heavy springs seated in recesses in the base, as shown, or on hydraulic jacks or rubber pads. The springs are normally of such length that they support the wipers on a level with the top surface of the male die member. The wipers carry vertical



Plan View of Female Die Member



Plan View of Male Die Member

Fig. 5—These plan views of the upper and lower assemblies of the die shown in Fig. 3 and 4 illustrate the arcuate form of the male and female die members. Note that the spacers and retainers mounted on the base carrying the male die member are of heavy section to withstand the heavy pressures developed in flexing the female die members

steel pins which are arranged to align the blank with the male die member. Length of the wipers is such that when they are in their normal positions their ends clear the spacer blocks at each end of the assembly.

The female die members, as shown in Figs. 3 to 7, inclusive, are provided with opposite faces that are parallel, respectively, with the opposite faces of the male die member and the retainers. The female die members that are to form right-angle flanges are firmly mounted on the upper die shoe, or base, while those designed to form flanges at acute or obtuse angles are mounted in such a way that lateral and lengthwise movement is possible in the plane of the base. The flexible mounting found most suitable for such members consists of a machine screw passing through a flexible rubber pad recessed in the base and an enlarged hole in the base. The screw is retained against vertical movement by means of washers recessed in the base, spanning the rubber pad and provided with enlarged apertures for passage of the screw. On top of the larger washers is a smaller washer which spans the enlarged holes in the lower washers. In each female member are clearance holes for the alignment pins carried by the wipers in the male die assembly.

Floater Serves as Pressure Pad

Between the female members is positioned a floater that is secured to the female die base by machine screws and is backed by springs of substantially less strength in the aggregate than the combined strength of the springs supporting the wipers in the male die assembly. The springs back of the floater extend into recesses in the female die shoe. The edges of the floater are parallel with adjacent faces of the female die members, and the lower surface of the floater conforms

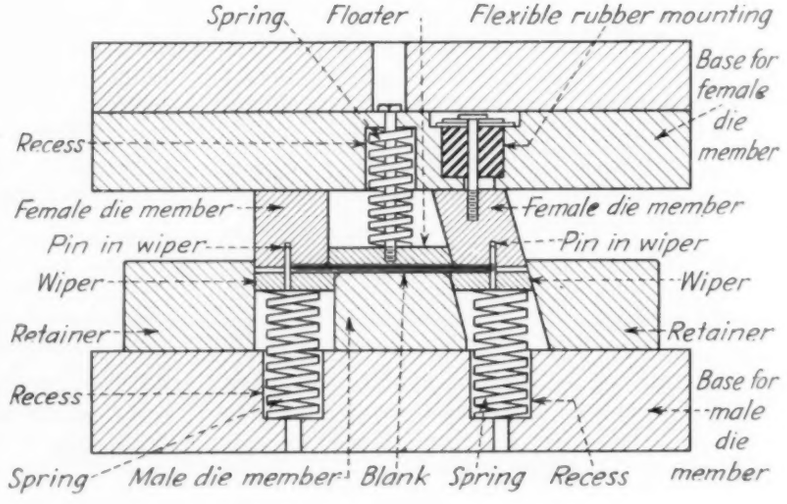


Fig. 6—Similar in design and principle to the die shown in Figs. 3 and 4, this die is arranged to form an arcuate channel section having one flange at right-angles with the web, and one flange at an obtuse angle. This view shows the die in open position. The closed position is shown in Fig. 7. If desired, the steel springs employed in these dies can be replaced with hydraulic jacks or rubber pads

in shape to the upper surface of the male die member.

Speaking generally, the clearance between the faces of the female die members and the faces of the male die member are approximately equal to the thickness of the metal blank to be shaped. The upper corners of the male die member and the inner lower corners of the female die members are rounded on a radius approximately equal to the thickness of the metal blank.

Radii Change as Die is Closed

As will be observed from an inspection of the lower sketch in Fig. 5, where the outer face of the curved male die member extends inwardly at an acute angle to the top surface of that member or the inner face is at an obtuse angle to that surface, the radii of the face or faces of both the die member and the retainer members will decrease from top to bottom as shown by radius lines *G, G* and *H, H*. Likewise, the radii of one or both of these faces will increase from top to bottom where the outer face of the curved male die member extends outwardly at an obtuse angle to the top surface of that member, or the inner face extends inwardly at an acute angle. As a consequence, the female die members in operation must conform. It is for this reason that the female die members designed to bend acute or obtuse angle flanges are mounted flexibly on their base, and they are formed from a material having the necessary inherent flexibility to conform to the decreased or increased radii. By way of example, the female die members may be formed of Masonite die stock, Bakelite, or some other plastic or semi-plastic material having the necessary solidity with respect to the metal being formed and the flexibility to conform to the changing radii as the die sections are closed in the press.

The wipers also must be made from a flexible ma-

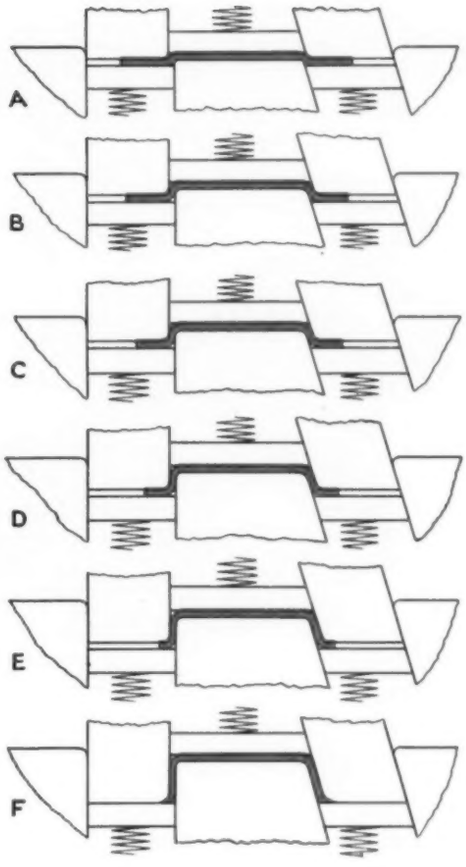


Fig. 8—Sketches *A* to *F* inclusive outline the steps which occur in rapid succession when forming a channel section in a Schlenzig-type mating die. First, the blank is located above the male die between the pins carried by the floating wipers. As the upper die assembly is brought down, the web portion of the blank is clamped by the floater carried by the upper die. As the ram continues to descend, the female die members conform to the faces of the male die member because of their pressure against the retainer members. The wipers, depressed by the female members as the ram descends, serve to strip the part from the male die member when the ram is returned

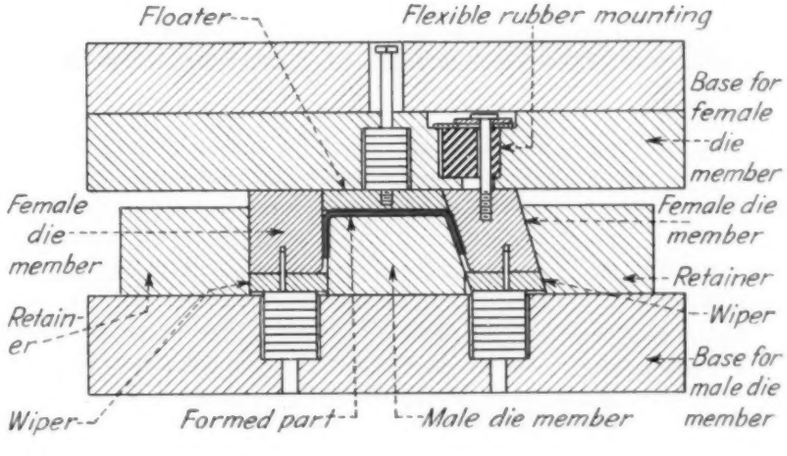


Fig. 7—This closed-position view of the die shown in Fig. 6 indicates the way the female die members move away from the male die member when forming flanges at an obtuse angle with the web of the channel

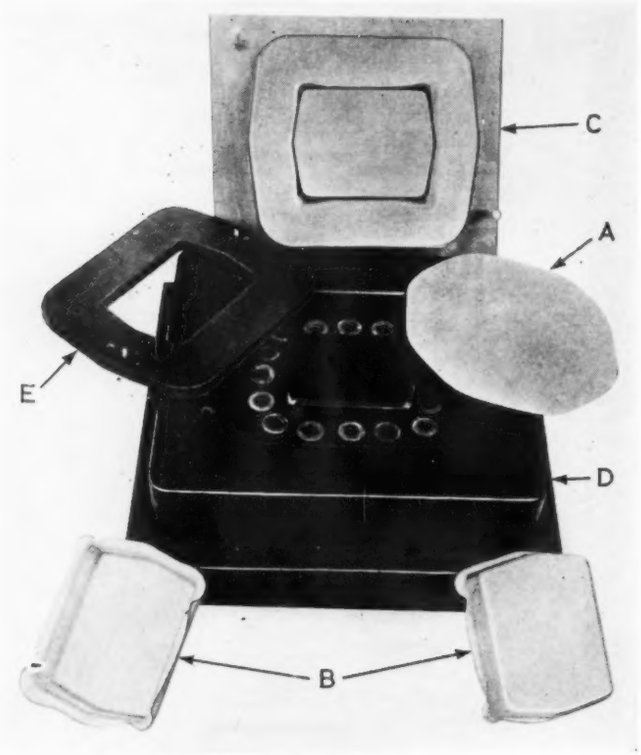


Fig. 9—This Masonite die stock die assembly finish draws in one operation the aluminum alloy boxes shown at *B* from blanks like that shown at *A*. Even though the sheet is 0.125-in. thick, 1/8-in. radii are formed at all corners

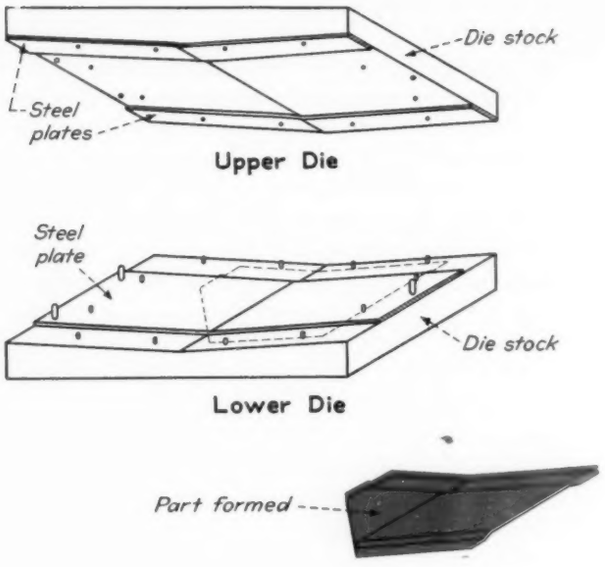


Fig. 11—Right- and left-hand aircraft parts are formed from 0.125-in. aluminum alloy sheets in this compound angle joggling die. It is made by shaping two heavy sections of Masonite die stock and then fitting steel plates of the thickness of the required side joggles. Alignment pins are placed to take parts of either hand

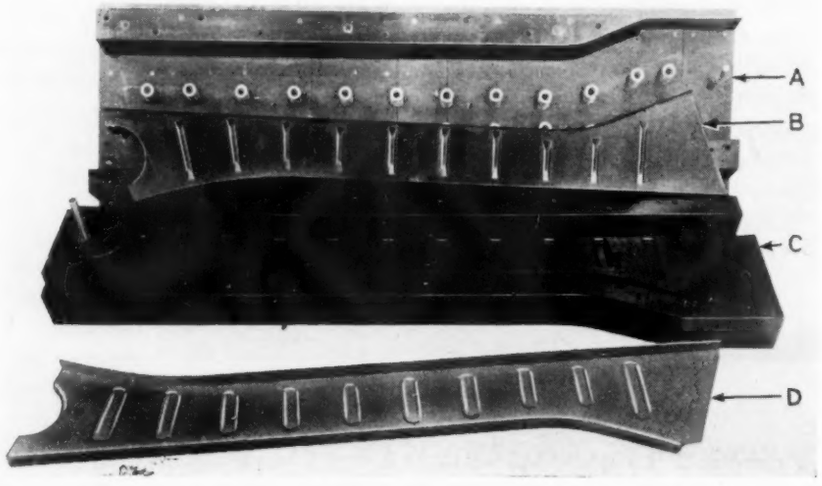


Fig. 10—About 6-ft. long, this semi-plastic die forms stiffening beads in the aluminum-alloy aircraft part shown at *D*, and at the same time turns the flanges along the two sides. These flanges are turned in opposite directions

terial, and must fit closely between the male die member and the respective retainer members, except at their ends. Clearance at the ends is necessary to permit them to conform to the changing radii as they are carried down into the die assembly. Masonite die stock or Bakelite also are suitable for these parts.

The operation of this type of mating die is outlined in Fig. 8, with the steps from *A* to *F*, inclusive, occurring in rapid succession as the press ram descends. The floater carried by the female die assembly first clamps the web portion of the blank to the top surface of the male die member. As the ram continues to descend, the female die members conform to the faces of the male die member, by virtue of the forcing action of the retainer members and their capacity to move laterally. In the drawing operation the wipers are depressed against their springs and serve to hold and support the flange portions of the blank throughout the forming operation.

When the flanges have been formed, the female die

members are retracted and the wipers serve to eject the finished shape from the male die through engagement with the edges of the flanges. In the ejection of channel sections where one or both of the flanges are bent inwardly, such flanges are sprung over the upper portion of the male die, but since they are drawn, rather than bent, in the forming operation, they spring back into shape after the part has been ejected.

The extent to which semi-plastic materials can be employed in the construction of dies for relatively heavy forming operations is well illustrated in Fig. 9. This Masonite die stock die finish draws in one operation a box 4 in. deep, 10 in. long and 6 in. wide, from a sheet of 0.125-in. thick Alclad 24S-0 aluminum alloy. Bend radii in all corners is only $\frac{1}{8}$ in. The blank *A* is cut to proper shape in another die, so that the finished pieces *B* can be drawn economically without too much metal wasted in trimming. The inverted

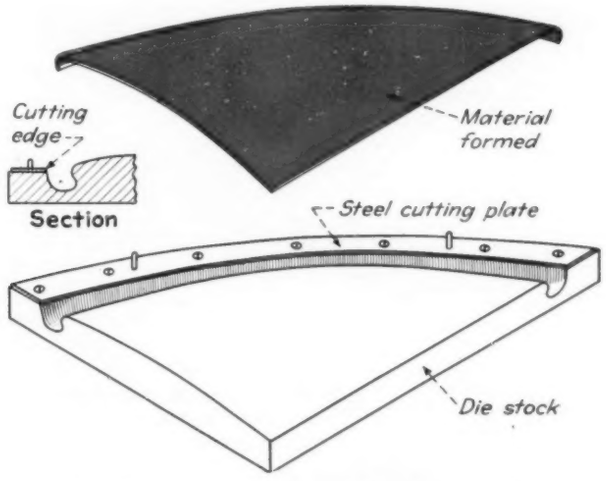


Fig. 12—Square or rectangular sheet sections are blanked and formed in one operation on this rubber-press die to form skin sections for a tail fin

Masonite die stock die *C* is carried on the ram of a single-action mechanical press while the punch assembly *D* is mounted on the bolster plate below. Assembly *D* consist of an inverted punch and a retaining wall, both of Masonte die stock and both securely fastened to a base of the same material. Socket holes in the base locate the heavy steel springs that support the die stock pressure ring *E* around the punch when the assembly is set up for the operation. This pressure ring serves both to restrain the blank during the drawing portion of the press cycle, and to strip the finished part from the punch as the ram returns.

Working surfaces of the punchand die shown in Fig. 9 are faced with sheet Bakelite to reduce the rate of wear caused by the heavy drawing pressure. This pressure is relatively high around the corners because of the small radii. The assembly was inverted, with the die above and the punch below, in order that the springs for the pressure ring would not have to be retained in position mechanically. With this design, it is an easy matter to remove the springs for use in other dies when this die is returned to the tool crib.

Flanges Formed in Opposite Directions

An unusual Masonite die stock for forming an aluminum-alloy aircraft part is shown in Fig. 10. This die is about 6 ft. long. It forms stiffening beads in the blank, and at the same time turns the flanges along the two sides. These flanges are turned in opposite directions, making the die layout somewhat difficult. The punch base *A* is recessed for the steel springs used to hold the loose punch *B* against the part while the die sections *A* and *C* are brought together by the press. Side walls on the punch base *A* and the die *C* serve as retainers to prevent movement of the stock as the punch descends. The three sections of this die all are made of Masonite die stock, as are the beads on section *B*. These beads are held in position by screws, not glue, and are sufficiently loose to permit their shifting when the die closes so that they will match properly with the head recesses in die section *C*. The finished 0.125-in. thick part of Alclad 24S-O aluminum alloy is shown at *D*. In ordinary practice, this seaplane part would have been formed in two or more operations, with a separate bending operation for each flange.

An inexpensive compound angle joggling die that has worked out well in use is shown in Fig. 11. This mating die is made by machining two heavy pieces of Masonite die stock to the shapes required, mounting steel plates as shown, and then drilling both upper and lower die sections for the alignment and location pins. These pins are pressed into the holes in the lower die, and have clearance in the corresponding holes in the upper section. The assembly is designed to form both right- and left-hand parts, the dotted lines on the sketch of the lower die indicate the position of a part during the operation. The parts formed in this die are cut from 0.125-in. thick Alclad 24S-T aluminum alloy sheet.

This type of die will give the same service as a steel die when forming aluminum alloys, and saves considerable steel in its construction. Further, it is much cheaper and can be made in a fraction of the time required to make a steel die for the same parts. This

particular job could not be handled by a single die in a rubber-platen press because of the thickness of the part and the requirement that the joggle be limited in area. The compound angles make it impossible to form the part satisfactorily in a press brake.

In addition to the developments made at the Naval Aircraft Factory in using plastic and semi-plastic materials for mating dies, a number of interesting hydro-press dies have been developed for use with rubber platens. In Fig. 12, for example, is sketched a die for blanking and forming a skin section for a tail fin where the edge of the section must be rounded beyond 180-deg. of arc. This die is machined from a section of Masonite die stock, and a thin steel plate is mounted as shown to provide the necessary cutting edge.

In Fig. 13 is shown a conventional piercing and forming die for hydro-press operations with rubber platens. The use of Masonite die stock and other semi-plastic materials for the major elements of such tools is saving many pounds of tool steel at the Naval Aircraft Factory—and in addition much time is saved because of the speed with which such tools can be constructed. Dies like that shown in Fig. 13 can be employed for combination blanking and forming operations on aluminum alloy sheet material up to about 0.051 in. thick. The part shown is made from 0.032-in. thick Alclad 24S-O aluminum alloy sheet.

An unusual die for forming an aluminum alloy part in a hydro-press with a rubber platen is shown in Fig. 14. Two die parts are employed. First, the blanked sheet is placed on the female die and the rubber platen is brought down to partly form the beads in the surface of the sheet. Next, the male die is placed on top of the part and the press ram brought down to finish the forming operation. For the third operation, the male die is placed on the press table, with the part on top, and the first flanging is done. Finally, a removable bending edge is taken off the male die and the flange along the straight side of the part is turned under by the rubber platen, as shown in the section drawing. This part is made from 0.091-in. thick Alclad 24S-O aluminum alloy sheet without difficulty.

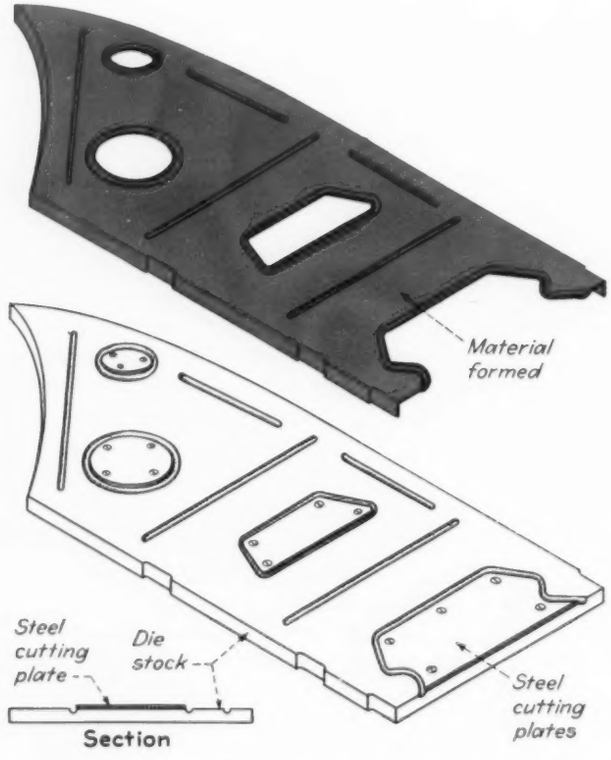


Fig. 13—The use of semi-plastic materials for piercing and forming dies used under rubber platens in hydro-presses has saved much time in completing tooling programs, and saves steel vitally needed for ships and guns

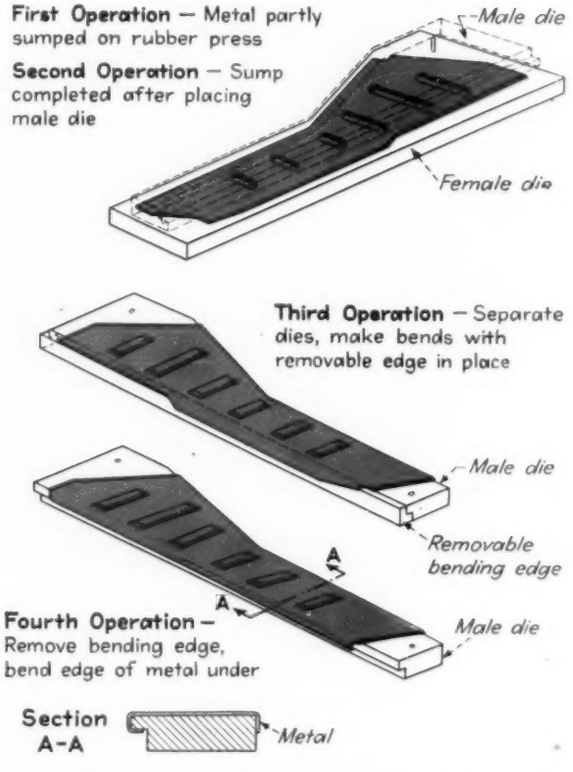

First Operation — Metal partly sumped on rubber press
Second Operation — Sump completed after placing male die
Male die
Female die
Third Operation — Separate dies, make bends with removable edge in place
Male die
Removable bending edge
A
A
Fourth Operation — Remove bending edge, bend edge of metal under
Male die
Section A-A
Metal

Fig. 14—Removable bending edges can be used to advantage frequently when forming sheet aluminum parts under rubber platens. This die took comparatively little time to make and solved a difficult production problem

Controlled Heat-Treating Atmospheres—I

BY C. E. PECK, HEATING ENGINEER, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

THE FOLLOWING DATA give the various types of separately prepared atmosphere derived from fuel gases and dissociated ammonia, the equipment needed to produce such atmospheres, and the application of each to various heat-treating processes. These atmospheres may be applied to modern furnaces, such as the bell, box, pusher-roller hearth, elevator, chain conveyor, and link-belt conveyor types. Furnaces are built gas tight and various means are utilized to minimize the consumption of atmospheres, as well as to maintain purity of the atmospheres introduced. Application of a separately produced atmosphere to existing furnace equipment should be analyzed thoroughly.

The use of these atmospheres has grown rapidly during the past few years. Proper application of them usually produces the following results: (1) Cleaning costs of heat-treated parts are reduced or eliminated entirely. (2) Grinding and extra machining operations are eliminated. (3) Soft skin or decarburization can be prevented, and as a result many pieces can be finish machined before hardening since no extra machining is required to eliminate soft skin. (4) Uniformity of product and close control of quality are made possible.

Table 1—APPLICATION OF CONTROLLED ATMOSPHERES

PROCESS	Atmospheres†	Equipment used§
Bright annealing of:		
Copper	1*, 5, 8	A
Various brasses (clean anneal)	1*, 5, 8	A
Copper nickel alloys	5*, 8	A, C, D, E
Low-carbon steels	2*, 5, 6, 7, 8, 9	A or A and D
Medium-carbon steels (no decarburization)	5*, 6, 7, 8, 9	A, C, D, E
High-carbon steels (no decarb.)	5*, 6, 7, 8, 9	A, C, D, E
Alloy steels, medium and high carbon (no decarburization)	5*, 6*, 7, 8, 9	A, C, D, E
High-speed tool steels (no decarburization)	5*, 6, 7, 8, 9	A, C, D, E
Stainless, chrome-nickel and chromium steels	7*	F
High-silicon steels (electrical sheets)	5*, 8*	A, C, D, E or C, D, E
Brazing of:		
Low-carbon steels	2*, 3, 4, 6, 7, 9	A or A and D
Medium—and high-carbon steels (no decarburization)	4*, 6, 7, 9	B
Alloy steels, medium and high carbon (no decarburization)	4*, 6, 7, 9	B
High-carbon high-chromium steels	7*	F
Stainless steels	7*	F
Non-ferrous copper and brass alloys	1*, 5, 8	A
Bright hardening of:		
Medium-carbon steels (no decarb.)	3*, 4*, 5, 6, 7, 8, 9	B
High-carbon steels (no decarb.)	4*, 5, 6, 7, 8, 9	B
Alloy steels, medium and high carbon (no decarburization)	4*, 5, 6, 7, 8, 9	B
High-speed tool steels	4*, 5, 6, 7, 8, 9	B
Bright tempering of:		
All classes of ferrous metals	2*, 5	A or A and D

† Refer to Tables 2 and 3 for composition, properties and cost of these atmospheres.
§ Refer to Table 4 for a description of the equipment needed to produce the controlled atmospheres.
* This atmosphere is the one most commonly used

Table 2—CONTROLLED ATMOSPHERES AND THEIR COST

Atmosphere No. See Note A	Air-gas ratio Note B	Approximate composition N_2	CO	CO_2	H_2	CH_4	O_2	Dew point	Fuel gas needed for 1,000 cu.ft. of atmosphere Note D	Cost per 1,000 cu. ft. of atmosphere Note E
1	9.50:1	89.0	0.5	10.0	0.5	0.0	0.0	Note C	115.0 cu.ft.	$0.08
2	6.00:1	69.0	10.0	5.0	15.0	1.0	0.0	Note C	145.0 cu.ft.	0.10
3	3.50:1	49.5	16.0	1.5	32.0	1.0	0.0	Note C	180.0 cu.ft.	0.15 to 0.20
4	2.38:1	40.0	20.0	0.0	39.0	1.0	0.0	—10 F.	200.0 cu.ft.	0.18 to 0.25
5	9.50:1	98.0	1.0	0.0	1.0	0.0	0.0	—50 F.	125.0 cu.ft.	0.20 to 0.25
6	6.00:1	72.0	11.0	0.0	16.0	1.0	0.0	—50 F.	150.0 cu.ft.	0.22 to 0.42
7	No air	25.0	0.0	0.0	75.0	0.0	0.0	—60 F.	22.2 lb.	2.00 to 4.00
8	1.88:1	99.0	0.0	0.0	1.0	0.0	0.0	Note C	13.7 lb.	1.20 to 2.40
9	1.25:1	80.0	0.0	0.0	20.0	0.0	0.0	Note C	14.9 lb.	1.30 to 2.60

NOTES:

A—These atmospheres are produced from fuel gases or dissociated ammonia, and are described in Table 3.

B—Air-gas ratios are representative for natural gas containing practically nothing but methane. For high-hydrogen city gas, the ratios are about 50 percent of the values given. For city gas with medium hydrogen and high CO, the ratios are about 40 percent of the values given. For propane and butane, the ratios are two and three times, respectively, the values given.

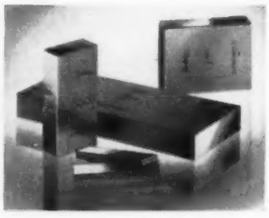
C—This dew point corresponds to room temperatures unless auxiliary drying equipment is added. Dew points may be reduced to 40 F. by simple refrigeration, and to −50 F. or less by adsorbent towers.

D—These values are for high-methane natural gas. For various types of manufactured city gas, double the values given. For propane and butane, requirements are one-half and one-third, respectively, of the values listed.

E—Costs are based on the following: Natural gas, 50c. per 1,000 cu. ft. Electricity, 1c. per kw-hr. Water, 5c. per 1,000 gal. Use of city gas usually doubles the costs listed here. The range of the cost for atmospheres 5 and 6 are due to the use of electric heat compared to steam for reactivating purposes in removing CO_2. The range of costs for atmospheres 7, 8 and 9 is due the fact that ammonia in tank-car lots is 7c. per lb., as compared to 16c. per lb. in cylinder quantities.

WE *MUST* HAVE GAGE BLOCKS TO WIN THIS WAR!

WHAT ARE GAGE BLOCKS?



● Except for the men who use them, few people know what Gage Blocks are. Briefly, they are small pieces of special steel accurate to a few millionths of an inch. These blocks are the basis of all precision measurement, furnishing the standard or pattern from which measurements used in manufacturing processes are taken. A simple illustration is this comparator being set against gage blocks. The comparator will then be used to check precision aircraft parts in production.

WHY ARE GAGE BLOCKS SO VITAL TO WAR PRODUCTION?

Mass production of war goods is made possible through development of *the system of interchangeable manufacture*. This term simply means that parts to be assembled into a complete unit–engine–gun–torpedo, etc., etc., can be manufactured with such uniform accuracy that any part can be interchanged with any other and the unit assembled from any group of parts without first selecting them to fit together.

To achieve this uniform accuracy of parts some constant *unit of measure* to serve as the basis of all precision measurements had to be found. The answer is gage blocks.

The entire system of interchangeable manufacture which alone makes possible our mass production of tanks, planes, guns, shells, ships, etc., etc., would not exist today—if it weren't for gage blocks.

We just wouldn't have any "War Production" if these little pieces of steel didn't exist.

HOW ARE GAGE BLOCKS MADE?

Gage Blocks were introduced into the U. S. about 30 years ago. Since then only three outstanding manufacturers of this unique product have arisen despite a constantly growing demand. Why should this be? The answer lies in the fact that the basic requirement of successful gage block manufacture is skill—or good old fashioned craftsmanship. This skill can only be acquired slowly, almost painfully and there is no substitute for it in the making of these fantastically accurate pieces of steel.

IN the WEBBER "Home of Precision" the Webbers—father and son—apply their two generations of craftsmanship with the aid of a complete staff of skilled artisans in producing gage blocks of as high quality and precision as the world knows today.

So well have they plied their craft that today WEBBER Gage Co. is the largest producer of gage blocks in the U. S.

Not only is WEBBER serving the tremendously swollen demands of U. S. war industries but WEBBER Blocks are being shipped regularly to other United Nations in all parts of the world.

Webber GAGE COMPANY
12901 TRISKETT RD., CLEVELAND, OHIO

AMERICAN MACHINIST REFERENCE BOOK SHEET

Controlled Heat-Treating Atmospheres—II

Table 3—TYPES OF CONTROLLED ATMOSPHERES*

No.	DESCRIPTION
1	Completely burned fuel gas with a slight deficiency of required oxygen so that a small amount of H_2 and CO is present. It is inert and slightly reducing. This atmosphere is principally nitrogen with about 10 to 15 percent CO_2 depending on the fuel used. Dew points are approximately at room temperature. Lower dew points may be obtained by means of auxiliary drying equipment.
2	Partially burned fuel gas with medium amounts of CO and H_2. It is combustible and medium reducing. Its reactions are sufficiently exothermic so that no external heat is required to operate the generator. Dew points are approximately at room temperature.
3	Partially reacted fuel gas with high reducing properties in the form of CO and H_2. It is combustible. Dew points are approximately at room temperature.
4	Completely reacted fuel gas. It is similar to No. 3, except CO_2 and H_2O are practically zero. Dew point is —10 F. and lower. Heat is required to carry reactions to completion.
5	Dry gas high in nitrogen with sufficient CO and H_2 to make the gas slightly reducing. This is produced by taking atmosphere No. 1 and scrubbing out the CO_2 and H_2O thoroughly. It is inert and noncombustible. It is a close approach to a universal separately prepared atmosphere.
6	Dry gas with about 70 percent nitrogen and with sufficient CO and H_2 to make it medium reducing. It is combustible. This gas is produced by taking atmosphere No. 2 and scrubbing out the CO_2 and H_2O thoroughly.
7	Dissociated ammonia—a pure dry mixture of H_2 and N_2 produced from cracking anhydrous ammonia at high temperatures. It is highly combustible. Dew points are under —60 F.
8	Completely burned dissociated ammonia with a slight deficiency of oxygen. Dew points are at room temperature unless auxiliary drying equipment is used. It gives a very pure nitrogen since traces of CO are not present.
9	Partially burned dissociated ammonia produced by burning atmosphere No. 7 with air so that a variable hydrogen-nitrogen can be obtained, depending on the amount of air used. Hydrogen content may be varied from 75 to 1 percent; balance is nitrogen. Dew point is at room temperature, but lower dew points can be attained with auxiliary drying equipment. It gives a very pure nitrogen-hydrogen mixture since CO, CO_2 and CH_2 and CH_4, which are a part of partially burned fuel gases, are not present. For the high hydrogen contents heat is required to complete the reactions. For hydrogen contents of 30 percent and under, heat is generated.

* The applications of these gases are listed in Table 1.

Table 4—EQUIPMENT FOR PRODUCING CONTROLLED ATMOSPHERES

A	Consists of an insulated refractory-lined combustion chamber filled with a suitable catalyst. Metered air and gas controlled automatically at a given ratio are mixed and pumped to a burner located at the entrance end of the combustion chamber. The gases leaving the exit side of the combustion chamber are cooled to within 10 F. of the available cooling-water temperature by an enclosed surface condenser. The resultant condensed moisture is caught in a separator and drained off. This equipment will produce atmospheres with air-gas ratios of 5½:1 to 9½:1, using methane as fuel.
B	Same as equipment *A*, except the combustion chamber is heated externally since heat is required to maintain lower air-gas ratios at sufficient temperature levels to promote chemical reaction. This equipment, using methane as fuel, will produce atmospheres with air-gas ratios of 5½:1 to 2½:1.
C	Consists of a complete auxiliary equipment to remove carbon dioxide thoroughly from generated gases. An organic chemical solution (monoethanolamine) is recirculated continuously to absorb the carbon dioxide. The liquid containing the carbon dioxide in solution is reconditioned by heating, which drives off the absorbed carbon dioxide.
D	Used for partial removal of moisture to dew points of about 40 F. It consists of a system of baffled finned coils inside a gas-tight cabinet through which the gas atmosphere is passed and cooled. A hermetically sealed refrigerating compressor moves the refrigerant through the cooling coils.
E	Used for complete removal of moisture to very low dew points. A dual tower filled with activated alumina absorbs moisture from the controlled atmosphere gas. The dual arrangement allows continuity of operation, because the moisture is being removed from the gas in one tower while the other tower is being re-activated by driving off absorbed moisture from the alumina bed.
F	This equipment dissociates anhydrous ammonia by heating vaporized ammonia to a high temperature as it passes through a catalyst chamber.
G	This equipment dissociates the ammonia, and the resultant gas is mixed with air and burned. The combustion equipment and its auxiliaries is similar to equipment *A*. In this case, however, dissociated ammonia is burned instead of fuel gas.

* Equipment here described can be used as indicated in Table 1.

HERE'S SOMETHING TO HELP YOU *Clear the Air*

HANDBOOK OF SPECIAL STEELS

Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 128 pages, pocket-sized, latest data.

ELEMENTARY DISCUSSIONS: TOOL AND STAINLESS STEELS

Informative booklets giving clear, detailed data on the various types of tool and stainless steels, their properties and handling. Excellent for training courses in metals and metalworking

THE lack of information can throw a pretty effective smokescreen around jobs on the production lines. After all, it's about the same as on the firing line—you can't hit them if you can't see them.

Your plant is probably no exception to the general run of war producers. All have a steady job on their hands of training a stream of new men and apprentices in specialized machine operations or other fabricating procedures. Where the needed information concerns alloy steels, you'll find invaluable the publications listed in the panel to the left.

They're primarily for production men. For engineers and designers, complete and certified technical data on the various types of stainless and tool steels is available in Allegheny Ludlum "Blue Sheets." ● Write for the information or the personal assistance you need.

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STEEL FOR THE NATION'S WELFARE

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"Getting Ours"

OVER THE LUNCHEON TABLE an acquaintance of ours confided that he had been offered one hundred pounds of coffee by a friend. The same offer was being made to others. Meanwhile across the street from where we were eating, people were standing in line for hours to buy a pound or less of coffee.

A girl in our town has a boy friend at an army camp nearby. He arrived last Sunday afternoon with his family's car and they drove many miles, seeing the countryside. The fact that gasoline was being rationed didn't bother them. He used the ration coupons given him as a member of the armed services to be employed for official business.

Down in an unspecified (censored) part of the country, where rationing of gasoline prevails, S coupons, good for five gallons each, are being freely passed around. Would you like to have some? If you are a local resident, you will find that they can easily be obtained.

A dining car patron on a popular express train asked the steward for another cup of coffee at breakfast. The steward replied, "Sorry, sir, we cannot bring you another cup of coffee. If you should ask for *a* cup of coffee, you might be able to get it." The patron followed the steward's suggestion and got his second cup.

One of the national unions has been asking for an agreement with the railroads whereby every diesel locomotive unit on a train must carry a fireman. Some trains have as many as three diesel units. The union knows that so far as usefulness or essentiality is concerned, firemen for diesel units are excess baggage. They are a carry-over from steam locomotive days. Yet the union is making such demand at a time when the federal government is wondering where it can secure enough manpower to prosecute the war vigorously. The union hasn't said where.

In a great factory turning out weapons of war a strike flared up. Though it lasted only a day, it cost tens of thousands of manhours and machine hours which are lost forever. Were fundamental human rights involved in this shutdown? Was the issue one which the men could not afford to compromise? The answer is that the dispute arose because men persisted in violating the management's rules prohibiting smoking.

We could go on with other stories of comparable nature, but why? All of them lead to the statement made indignantly by a friend, "On the basis of these things, we have no one to blame but ourselves if we lose the war."

Every man for himself. Each person looking out for his own selfish interests, spending valuable time and energy figuring out how he can beat his own government rather than how he can beat the Germans and the Japanese.

Our enemies are engaged in a holy war. They are prepared to make any sacrifice necessary to achieve victory. Their own personal safety or comfort or future are as nothing compared with winning the war for the fatherland.

We cannot win against them with a "bootlegging" philosophy. Our men in Britain, on the north Atlantic patrol, in the Solomons, in India, in Egypt cannot fight alone. They must have the full and unqualified support of all of us back home. If we persist in "getting ours" no matter what the cost to the national war effort, the war may not only be prolonged, but we shall stand an excellent chance of losing it.

Burnham Finney

GAGING BUSINESS

War production is being rescheduled to emphasize the materiel demands of the armed forces. Production of items now overstocked will be reduced conservatively. Production of now lagging items to be emphasized

Rescheduling to Correct Balance Rescheduling of war production on a huge scale is in the making and has already been partially accomplished. Scarcely any line of raw and finished products will escape the shift in emphasis. Lack of balance in war output is far more serious than has officially been realized, and certainly is way beyond anything the public understands. The output of some lines of critical implements of war is much less than indicated by general statements thus far released by the government. Several goals set right after Pearl Harbor have not been reached in units produced.

Failure to provide effective over-all control accounts largely for the situation recently confronting those placed in charge of war production in Washington. One result is that minor parts or auxiliaries of large units are not available to equip the main units coming off the line. That has been especially true in aircraft. Equally serious is over-production of certain components beyond immediate needs.

WPB Schedules Aircraft Output Some sweeping WPB staff changes have taken place because of the situation. The aircraft set-up is the first to feel the effects of the new policy. WPB has taken over the scheduling and direction of all aircraft output. The armed services hereafter will clear all plans for aircraft requirements through WPB. Once the requirements are determined, WPB will fix production schedules and see thaty they are maintained, relieving the armed services of authority to make manufacturing changes.

Aircraft production will be stepped up at first by securing greatly increased output from existing plants. Some construction of new factories may be unavoidable, but the plan for vast expansion through erection of numbers of new plants is to be drastically modified in the near future.

Quick results a short time ago in speeding up aircraft manufacturers have turned up the production curve again after it had been on a plateau for some time.

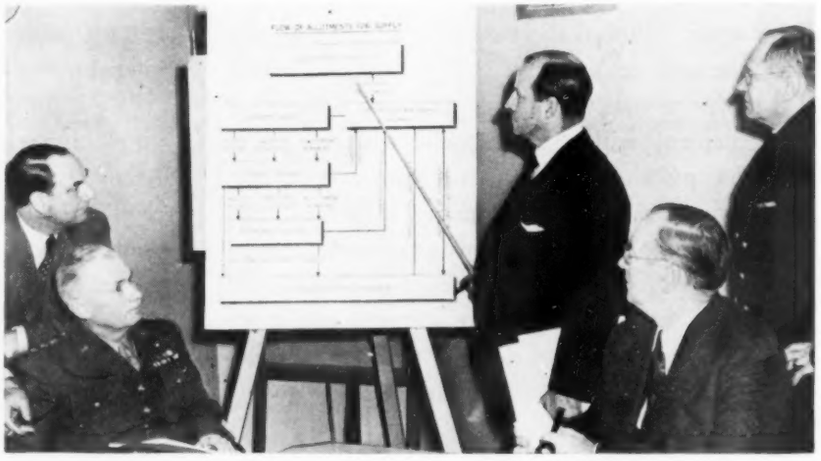
The cutting down of production of items on which the government is far ahead will be done conservatively. Strenuous attempts instead will be made to increase the output of items that are behind. Contractors behind schedule will be under stiff pressure to increase operations. In some cases management may expect drastic action if failure to come up to schedule persists.

Reduction of Items Disputed Reduction in the number of items produced by a contractor is still being fought over, with good prospects that those favoring this policy will win out. Each steel mill, for example, may be cut from rolling numerous items to a few. Mills that can roll certain products to best advantage would be concentrated on such products. This same idea is in mind for a wide variety of raw materials and finished products. Production of raw materials that are especially scarce, such as pig iron, will come in for tremendous pressure to get even more out of existing facilities.

1943 Aircraft Aims Are High Obtainable 1943 aircraft goals, reported to be set at 185,000 units will dwarf this year's output under the practical production schedules now being developed. It is admitted that the present year's volume will fall short of the goal originally established, partly because quantity has been sacrificed for quality. More big, heavy bombers and fewer fighters have been turned out. WPB top officials are confident that the 1943 schedules can be met, but only under the greatest sort of pressure on both management and labor. To reach them will mean upsetting many other lines of production, with what are now considered essential civilian lines bearing the brunt of curtailment necessary to secure the required materials and manpower.

In the machine tool field, the green light has been given to orders for aircraft production. Producing machine tools for the aircraft makers becomes the industry's No. 1 job, superceding all others. This action is in line with the decision of war authorities to attempt to build an almost unbelievable quantity of war planes in 1943. To accomplish the objective given them, machine tool builders must again rearrange their order boards, which in itself is no mean operation.

Over-all Orders Are Decreased The industry itself as well as WPB has been in the process of screening the orders now on hand for machine tools. In several war fields, including aviation, the screening process already has resulted in a sizable decrease in the number of over-all orders. Most war contractors protected themselves by placing orders for more machine tools than they really needed. These unnecessary orders are today being lopped off the industry's backlogs. That is a healthy development.



Eberstadt Explains—Progress of allotments of controlled raw materials from the requirements committee to the industrialists who produce the goods is traced on a chart by Ferdinand Eberstadt, WPB vice chairman in charge of regulating the flow of raw materials. Listening to him are, left to right, William L. Batt of WPB, Lt. Gen. Brehon B. Somervell, Donald Nelson, WPB chairman and Rear Admiral H. L. Vickery

Despite Stormy Crossing, CMP Has Landed

Governmental agencies will decide what products they need. Manufacturers will estimate materials necessary to meet schedule and WPB will allot available supply

BY ROBERT COLBORN

WASHINGTON — American industry this month got what everyone hopes are its marching orders for the duration of the war. The Controlled Materials Plan, which has been going through a stormy gestation inside WPB for the past month or more (*AM*—Oct. 29, p. 1254c), is now public property. WPB is already working with manufacturers of aircraft and ships to line up production schedules and bills of material to start the plan in the second quarter of 1943, and it's planned to have all industry under the plan by next July.

At the beginning, CMP controls only the flow of steel, copper, and aluminum. Other materials may be brought under it later. Meanwhile, distribution of other metals as well as of tools and machinery continues to be governed by the P.R.P. and other priority rating systems.

Fundamental to CMP is a decision by the Army, Navy, Maritime Commission, Lend-Lease, and BEW (for civil exports) as to what products they want made for them and by whom for each of the eighteen months starting April, 1942. A similar determination on non-military goods is to be made by WPB's Office of Civilian Supply under Leon Henderson. Decisions will be firm as to the first three months, tentative thereafter.

Manufacturers Will Report

These schedules will be turned over to the manufacturers of the end products, who will be required to report back on the amounts of material needed each month to meet these schedules. The manufacturers will make this computation themselves as regards their own fabrication. Where they buy parts from sub-suppliers, they will obtain the information from them.

The final report will show, for a single complete finished item, the amount of each scarce material in it (including fabrication loss, rejects, etc.), and the "time lead" on the material—the number of months the basic material must be delivered before delivery of the finished item.

With these reports in hand, each "claimant agency"—Army, Navy, etc.—reduces its production program to a statement of month by month consumption of three controlled metals—steel, aluminum, and copper.

This information and the proposed production programs are turned over to WPB. There the three material branches, the Office of Program Development, and the Requirements Committee pare the programs down to match the anticipated supply of the three materials. Assumption is that if a program is small enough not to overtop the supply of steel, aluminum, or copper, it will not often run into shortages of other materials.

Eventually, the plan will probably be extended to cover other materials; rubber is an early candidate. But it is not likely that it will ever have to cover all scarce goods.

Materials Will Be Divided

The revised production programs then go back to the claimant agencies. With them go allotments of definite tonnages of the three metals each month for three months. In part, the allotments will be tied to definite production programs. This may be done in aircraft and related items. By and large, the agencies will be free to adjust their programs within the permitted amounts of materials.

The agencies then furnish their end-product contractors with month-by-month output schedules and with corresponding month-by-month allotments of all the three metals which enter the product. The end-product contractors notify their suppliers of the schedules of parts production they must maintain and divide up their allotments among their suppliers, much as a priority rating is extended under the present system.

Firms having allotments or portions of allotments may place orders for the three metals with any mill they choose, except insofar as WPB has ordered certain mills to concentrate on certain products. The firms will also have priority ratings, which they will use to buy other materials. To permit long-term scheduling, claimant agencies are allowed to pass out materials for the coming quarter up to 80% of their allotment in the current quarter, to 60% for the following quarter, and 40% for the one after that.

Civilian Items Scheduled

Handling of civilian products and goods—bearing, screws, etc.—which was not custom-made is still a little vague. Some civil items, perhaps locomotives and auto repair parts, for instance, will be scheduled by WPB's Office of Civilian Supply just like munitions. In other cases a horizontal system similar to PRP will be used. Firms will submit statements of requirements of the three controlled materials to their industry branches. These will be consolidated by Civilian Supply, which will receive an allotment from Requirements Committee.

Other significant details of the plan include provision for reporting excessive inventories of the three controlled materials, for maintaining stocks of the materials in warehouses, for permitting small sales—such as nails to farmers—without allotments.

CMP will not be in full effect for eight months. Preparation of schedules and bills of materials on top-rated military goods such as planes and ships is beginning at once.

Step Into Top Posts—George H. Johnson (left) has become Director of the Tools Division of WPB, and John S. Chafee (center) will serve with him as Deputy Director. Because of his new duties Mr. Johnson has resigned as president of N.M.T.B.A. and is automatically succeeded by Walter W. Tangeman (right), who was recently elected first vice president

Manpower Draft Legislation, Deferred, May Operate Through Existing Agencies

WASHINGTON—Faced with strong opposition from labor, considerable opposition from industry, and a Congress not too happy about the idea, Roosevelt has decided not to press now for labor-draft legislation. War Manpower Commissioner McNutt has been urging passage of a law giving him the power to tell people where they must work and at what. But now he'll have to be contented, for a few months at least, with use of the non-statutory measures open to him. By the time you read this, a White House executive order outlining such measures may have been issued. But there's a lot McNutt can do even without such an order.

With no powers of his own, McNutt can make use of the powers of other agencies to obtain manpower controls, as by having Selective Service freeze men in their jobs, by having WPB shut down non-essential industries, by having the Army and Navy order their contractors to hire all men through the U. S. Employment Service. McNutt's difficulty is that with so many other agencies working on manpower, the Manpower Commission itself may drop out of the picture.

Concentration of hiring in USES will immediately put a considerable crimp into labor-pirating. Simply by refusing clearance to unjustified transfers of men from one war plant to another, USES can end open pirating. It will of course be pretty hard to prevent employers from sneaking a shanghaied worker in the back door now and then. To an extent USES can also force employment of local labor, women, negroes, aliens by refusing to certify anyone else.

However, to go much deeper than this into manpower control, McNutt must turn to agencies over which he has only rather formal control. To get a concrete man-by-man control over labor pirating he must use the Selective Service, as in last month's order freezing dairy, livestock and chicken labor to their jobs.

Even harder to reach except through other agencies is the problem of inducing men with non-essential jobs to move into war jobs. Selective Service has been providing a push in this direction for months, ever since it started dividing married men into 3-As and 3-Bs, according as they were in non-essential or essential jobs. A more drastic approach would be for WPB to force men loose from unimportant jobs by shutting down or restricting the operations of unimportant industries.

Big difficulty with this sort of non-statutory manpower program is the synchronization of the activities of a lot of not always cordial agencies. Key man for this will be the labor utilization inspector. WMC now has funds with which to put its own inspectors in the field—on a resident basis in large plants, on a travelling basis for small ones. These inspectors will keep a constant check on the labor practices of the plants they cover, will watch for labor hoarding and pirating, inefficient use of labor, and the like, will call on Selective Service, USES, WPB, or the procurement agencies to clean up bad spots.

It will come rather hard to McNutt to lean on the WPB when he is already suspicious of the motives of vice chairman Ferdinand Eberstadt in setting up what amounts to a little manpower commission in WPB's Office of Program Development.

As it turns out, WPB's Labor Requirements set-up goes far beyond McNutt's simple specifications. On the one hand it plans to get right down into detail as to the specific labor needs, in terms of trades and training programs, of individual plants and areas, in setting up a series of regional editions of itself to do the job. On the other hand, it is assuming the responsibility of deciding how labor supply affects the feasibility of proposed production programs.

Actually, as long as an effective manpower authority is lacking, both WPB and Selective Service are forced by the exigencies of their own jobs to encroach on the manpower job. Selective Service entered the stage of doing a manpower rather than a mere conscription job when it began to draft men with dependents. Now dependency is about to become a secondary factor in determining who fights, and occupation will be the prime consideration.

This does not mean that men in essential jobs can relax. There are some essential activities—mining and farming for instance—in which the work is so nasty, the pay so low that it's almost impossible to find replacements for present workers. In such fields deferment will be more or less permanent.

But in industry generally, the question is not so much "who" as "when." Employers should expect that nearly all their physically fit men of military age will be called within the next year or so, will have to be replaced with women, children, older men, men in poor physical shape. By present plans, about 10,000,000 men will be in the Army and Navy at the end of 1943, and these must come from something like 13,500,000 men of the right age and health.

However, no one can replace all his employees at once, and occupational deferment thus becomes a matter of figuring out who should and can be replaced first. This is worked out in terms of the essentiality of the particular job, the time it takes to train a replacement, and the worker's dependency status.

The mechanics of occupational deferment will continue much as at present as regards small local employers. The draft boards will study each man separately as to whether he holds a critical (skilled and scarce) job in an essential industry. Informal arrangements may be worked out to avoid accidentally stripping an employer all at once.

For big employers, however, the preferred arrangement is coming to be the so-called "manning" tables which all major war plants are being ordered to prepare. This is a plan by which study of the entire personnel situation of a plant is made—how many men it has and must have in each occupation, how long it takes to train replacements, what the age and dependency status of each worker is. On the basis of these facts, a schedule of withdrawals of men into the Army can be worked out which will be as fast as possible without crippling the plant. Then local draft boards are instructed to conform to this schedule.

First Annual John Wesley Hyatt Plastic Award Made

NEW YORK—The annual John Wesley Hyatt Award, for an outstanding contribution in 1941 to the plastic industry, was conferred on Dr. Donald S. Frederick of Rohm and Haas Company.

Dr. Frederick was honored for his work in adapting transparent, colorless acrylic plastics to the needs of American military aircraft. Prior to the successful development of sections of this plastic large enough to make a bombing plane's "nose," the use of plastics by the aviation industry had been limited to areas considerably smaller in dimensions.

"Plexiglass," the methyl-methacrylate plastic used in the development work of Dr. Frederick and associates, forms cockpit enclosures, gun turrets, broad windows, domes and other key parts as well as bomber "noses."

Arc-Welding Contest

NEW YORK—To further interest in arc-welding generally, and to give recognition to those who are doing their part in expediting production by its use, Metal & Thermit Corp. has been conducting a contest for photographs and descriptions of welded work.

Started in July, awards have been made, or scheduled, for entries during the alternate months to and including November. Top prize during each of these months is a $100 war bond; there are 26 prizes in all.

Among the winners of the September contest were H. T. Kranz, engineer, Industrial Brownhoist Corp., Hugh Fairclough, mechanical engineer, Dow Chemical Co., Henry Leopold, superintendent, Southern Extract Co. and Vincent Idziak, welder, Grand Rapids Metal Craft.

INSIDE DETROIT

BY RUPERT LE GRAND

Workers, given the means of locating riding companions, are solving the share-ride problem without any detailed records, extra employees or unpleasantness which might result from arbitrary creation of groups

Simplicity is Key to Plan Good news for plants struggling to avoid a collapse of war-worker transportation with the advent of nation-wide gasoline rationing is contained in the Briggs share-ride plan.

The Briggs plan is so ridiculously simple that the reader may wonder why it is worth comment. But that is the reason—simplicity. For the Pontiac plan and the share-ride contract sponsored by Army Ordnance require the creation of a "war worker transportation department" to survey residential locations of workers; tabulate shift, race, sex; work out the details of riding clubs; hook the entire program to the local public transportation system if possible.

In the case of Briggs Mfg. Company, with 19,000 people on the payroll (with 36,000 mentioned for peak war production), H. J. Roesch, director of public relations, figured that at least 50 people would be needed immediately to handle the administration and clerical work incidental to a formalized program. And the executives, clerks and office equipment required could be used for other vital war tasks.

Voluntary, can run itself The Briggs plan needs no record system; it runs itself. There are no compulsory features. Workers choose their own riding companions, thereby avoiding the complications that arise if unfortunate combinations of race or sex are chosen by a clerk unfamiliar with the group. And since the workers themselves are fully responsible for the results achieved, outsiders—from labor or government—can't blame the management.

Roesch had a map of Detroit—9 ft. square—mounted on a wood drum that revolves upon standards at convenient reading level. This map is ruled into squares, each representing one square mile. Each square is numbered. This drum is placed in a convenient shop location.

Three racks, one for each shift, are placed near the map. Sections of the racks are numbered to correspond with the map squares. Each section contains two pigeon holes, one for "drivers" and the second for "riders."

Employee Finds Own Companion This is how the equipment is used. The employee picks a card out of his time card rack at the gatehouse. The card has his number and department stenciled there-on, with a space to write in his address. He takes the card to the map, looks up the map square in which he resides, then deposits the card in the proper section of the swap-ride rack for his shift.

Workers watch the racks. When more than one card is deposited in the same rack section, the persons concerned get together at a plant point designated by the map square number. There they work out the details of the swap-ride club, take in riders who do not own cars if they so elect.

Workers Like the System How has it worked? As a starter, Roesch applied the plan at the Vernor Die Plant before extending it to the larger Briggs production plants turning out aircraft material and other war goods. About 60 percent of Vernor Die employees drive to work in ordinary times. Although gas rationing was still several weeks away 80 percent of these drivers voluntarily made up swap-ride teams when the means were provided.

They like it too. Bosses are riding with men in the shop, and vice versa. Under ordinary conditions men can work for years and never realize that they live only a few blocks from each other. With winter in the air, they appreciate getting into a warm car, being driven quickly to work or home, without several waits for street cars or buses at transfer points. Night-shift workers especially appreciate swap-ride teams because bus service is poor in the early morning. Since most of the workers own cars, those accustomed to use buses are now joining swap-ride clubs, which puts more cars in service but spreads the wear on tires and parts, saves more gasoline for all. This practice has lightened the load on an overburdened local public transportation system. In other words, the Briggs plan makes a simple job out of an involved matter, when workers are given a little help in solving their problems in the American way.

Auto Men Don't Like WPB's CMP The automotive industry is not satisfied with the Controlled Materials Plan finally announced by WPB after much behind-the-scenes wrangling, but says that its members will "exert themselves" to make the program work. Paper work which the industry tried to avoid with its own Materials Flow Plan, and a lack of

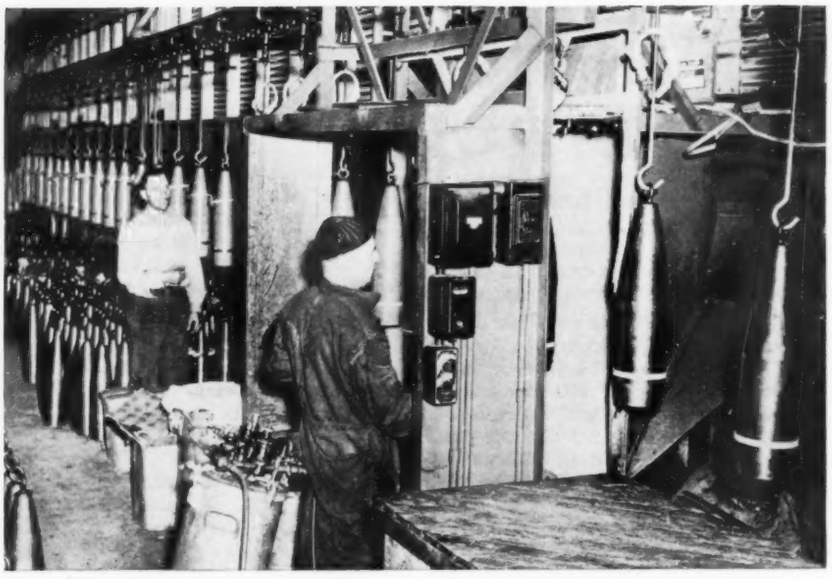
Cafeteria-Style — Given the means to find companions for share-ride groups, Briggs Mfg. Co. workers have taken over with ease a job that promised to demand the formation of a special department and the hiring of many extras

flexibility to meet changing schedule needs and the manufacture of new products are two points which may interfere with successful CMP operation.

The industry does agree, however, with one basic principle in the program which will govern the flow of materials to war plants, starting with the second quarter of 1943. For a spokesman says that: "Scheduling of the number of units to be produced, based on the amount of material actually available, as undertaken in this plan, is the only sound approach to materials control under present conditions."

Under CMP, the various contracting agencies, or "claimants" of materials—the Army, Navy, Maritime Commission, Lend-Lease, Board of Economic Warfare—must first decide what products they want made and by what prime contractors for each of the eighteen months beginning with April, 1943. These schedules will next be turned over to the prime contractors who will report bills of material needed for each of the months. Data must also be obtained from subcontractors by the makers of the end product, so that the total required amounts of controlled metals—copper, aluminum and steel—to be reserved, including fabrication losses, are known. The "time lead," or period between receipt of material at the fabricating plant until delivery of finished goods must also be known.

Total monthly consumption of materials plus end-product schedules will next be turned over by the several services to WPB for comparison with total material supply. Revised production schedules with tonnage allotments for each month for a 90-day period will be issued by WPB to the services. Finally, the services send prime contractors month-by-month output schedules and metal allotments to correspond.



In Keeping with the Past—The Taylor-Wharton Iron and Steel Co., during this, its 200th year in the iron industry and its 50th as a producer of Manganese steel, is manufacturing shells, tank treads, rail equipment and other material and equipment necessary to the war effort. High explosive shells pass to a booth where they are sprayed with yellow lacquer to indicate that they are ready for shipment to another plant where they are loaded

A Statistical Behemoth

This procedure requires more paper work before materials can actually be ordered than the method contemplated in the Materials Flow Plan sponsored by automotive leaders. It is to be hoped that the system can be tightened up so that the unfortunate delays in processing PRP applications for current fourth-quarter allotments do not recur.

Flexibility may be jeopardized by the paper work inescapable with CMP as now set up. The auto industry originally advocated that say ten percent of supplies be set aside to care for changes.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

CADMIUM—Sellers may use adjustable pricing contracts to ceiling levels in effect at time of delivery on primary and secondary cadmium. (Amendment 2, Revised Price Schedule 71.)

GRAY IRON CASTINGS—Regulation simplifies procedure for determining maximum prices for continuously-changing variety sold commercially. (Maximum Price Regulation 244.)

HAND TOOLS—Shovel manufacturers who had in their possession before Aug. 10, 1942, inventories of raw and partly processed steel in shapes and sizes are permitted to continue fabrication. (Amendment 3, Limitation Order L-157, Schedule I.)

MALLEABLE IRON CASTINGS—Maximum prices for each seller shall be the highest prices charged between Oct. 1 and 15, 1941. (Maximum Price Regulation 241.)

STEEL PRODUCTS—National emergency specifications, designed to limit the manufacture of steel mill products to minimum number of varieties which will satisfy current needs, have been established. (Limitation Order L-211.)

X-RAY EQUIPMENT—Strict control over production and sale has been established. Manufacture of any models or types other than those listed in Schedule A attached to the order is prohibited. Sale, transfer or delivery except to Army, Navy, Maritime Commission and War Shipping Administration and certain authorized persons is prohibited. (Limitation Order L-206.)

Steel Cartridge Cases in Production by New Year

WASHINGTON — Change-over from brass to steel cartridge cases for all types of fixed artillery ammunition will be complete before the first of the year, the War Department has announced. Cases range in size from 20-mm. to 105-mm.

Substitution of steel for brass in the manufacture of artillery cartridge cases, a major development of Ordnance, is part of a broad Army conservation program, made necessary by war demands on critical materials.

Maj. Gen. Levin H. Campbell, Jr., Chief of Ordnance, Services of Supply, credited the Ordnance Steel Cartridge Case Industry Integrating Committee with the accomplishment, which he described as "amazing." This development would have taken from three to four years in peacetime, he said, whereas in war it was done in six months. He pointed out that one factor which had speeded the change-over is the perfection of a cold-forging process which turns out cartridge cases in a matter of moments. Only two minor machine operations then remain before the case is ready for shipment.

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Ordnance has liked results and experiments with steel shell production in larger calibers; experimentation is beginning on smaller calibers. Conversion to war production of metal-working industries is progressing

Is Pleased With Shell Output Grapevine information on steel shell production has been a bit misleading lately. You may have heard that Ordnance has met with serious disappointments in this most important conversion from brass to steel.

On the contrary, Ordnance is well pleased. Production of artillery shells is now under way on a mass basis. A few plants have trouble here and there, as expected. Officers say it seemed harder for old-line brass shell people to make the change, in some cases, than it was for new producers to get the hang of steel.

In case you are not up on background: Ordnance started, long before Pearl Harbor, an effort to design steel shells so that they would be ejected from the breech of the gun as quickly as brass shells. Brass has long been regarded as the only practical metal which would cool and shrink rapidly enough for modern rapid fire. Brass shells are, or were, the biggest war consumer of copper. It was known that the Germans were trying steel. Our Ordnance people went to work on it, in their own shops and in those of manufacturers, and succeeded. They say now that they have done a more successful job than the Germans have done.

To Try Steel in Smaller Calibers Now Ordnance is going to work on small arms shells, including machine guns. That is where the grapevine went wrong. Experimentation on the small calibers of course involves new problems, and many disappointments have turned up, as expected. These have been erroneously associated with the original program of artillery shells. Some people got the impression that Ordnance was misleading the public. Ordnance has made no claims at all about small shells, thus far. Its policy is to wait and see.

Incidentally, and arbitrarily, artillery shells include all those between 20 and 105 mm., and small arms includes everything less than 20 mm., which would be mostly .50, .30 and .45 caliber.

WPB Reports on Conversion Conversion to war production of the metal-working industries is summed up by WPB thus:

Autos: In the 1941 model year the industry employed 500,000 men, produced $4 billion worth of goods. By August, war employment had reached 640,000; July production was at a $6 billion a year rate.

Domestic Refrigerators: 1941 peacetime production was a half-billion, employed 36,000. War employment is now back to normal, though output is only about half the peacetime rate. Peak output will be reached late in the Spring.

Washing machines: Peacetime output was $112 million a year, employment 13,000. Conversion is incomplete, with only 8,000 employed in August, a July output at an annual rate of $36 million.

U. S. Army

ASST. CHIEF, TANK CENTER

Brig. Gen. J. H. Christmas has been appointed asst. chief of the newly-established Detroit Tank Automotive Center, Ordnance Dept. Establishment is in keeping with Army Ordnance policy of decentralized operation.

Sewing machines: In 1941, 12,000 employees produced $41 million of machines, 56 percent of them industrial sewing machines. By July, the entire industry was producing at a $48 million a year rate, 70 percent of it industrial sewing machines, most of the rest munitions. Employment in the domestic sewing machine plants is not yet normal but is expected to pass the normal number early next year.

Bicycles and motorcycles: Although bicycle production has been cut to about a tenth of normal, little conversion has yet been achieved. Motorcycle production is going strong exclusively on Army orders.

Oil burners: Peacetime production by 11,000 employees was $90 million a year. Conversion is still incomplete, and August output was at an annual rate of only $24 million of which 70 percent was industrial oil burners, the rest munitions.

Radio: This industry required little technical change to convert. Output of military radios is now at better than five times the peacetime annual output of $235 million a year. Employment is about 20 percent above the peacetime figure of 35,000.

Military Control Less Likely Critics who have seen disturbing evidence of military control over industry in the rise of former Munitions Board chairman Ferdinand Eberstadt to a dominant position in WPB were comforted by last month's order requiring WPB clearance of all plant facilities. This policy is Eberstadt's baby, and it is one of the toughest moves WPB has yet taken to discipline the Army, involving the crucial dispute over the scale of the munitions program. Before Pearl Harbor, Nelson and his friends in the old OPM had to needle the Army into raising production sights to near-war levels. Since the shooting started, however, WPB has been trying to induce the generals, in laying out new plants, to be less starry-eyed about how far the country's material and human resources will stretch.

Types, Grades Are Defined WPB Limitation Order L-211, issued Oct. 23, is designed to limit the output of steel products to the smallest number which will meet the need, and to set up specifications defining compositions, types, grades and qualities.

The first two schedules, issued concurrently with the order, cover concrete reinforcement of steel, and railroad and transit service wheels and tires.

It is expected that the standardization program will increase production by leading to the more efficient use of production facilities, and that it will reduce consumer inventories for maintenance and repairs.

Meanwhile, WPB approved a $26,000,000 addition to the steel plant being built at Fontana, Calif., by the Kaiser Company, Inc. Facilities will be completed in about 12 months, with a capacity of 225,000 tons of steel ingots.

Freeze of Canadian Business as of Nov. 1 Is Prelude to Progressive Contraction

OTTAWA—Freezing of all Canadian business except production of war supplies at the position and dimensions obtaining at Nov. 1 is designed to facilitate progressive contraction for the release of manpower, materials, electric power and service facilities for war purposes. The sweeping order of Wartime Prices and Trade Board, business control and contraction agency, prohibits the opening of new manufacturing or processing plants and wholesale or retail outlets and bars manufacturers and distributors from producing and dealing in any lines of goods they were not handling on the last day of October. Provision for exceptional circumstances will be taken care of under a permit system. Control authorities figure that the carrying out of the contraction program will be easier with all units of business pegged at their current level of activities.

Scope of Work to Freeze

A plant that has been making castings and forgings only will not be allowed to engage in the manufacture of other lines except on a war supplies order from the government. A manufacturer who has not been operating a wholesale outlet is barred from opening one and a wholesaler who has not had retail outlets may not enter the retail field. Wholesale and retail dealers must stick to the lines they have been handling, may not add to them. A firm engaged in manufacture or trade may not move to larger premises. Sale of a business will require a WPTB permit.

Contraction is Beginning

The program of actual contraction is rapidly taking shape. Its application, however, will not be sudden but on a progressive scale to meet gradually increasing manpower shortages in war production as war plants are combed for recruits for the fighting services. Essentiality is established as the yardstick of contraction and control officials recognize that all divisions of civilian business contain elements of essentiality. They plan to eliminate only non-essential elements.

This will lead to large-scale but gradual telescoping of units in all manufacturing industries and distribution trades. One plant will be assigned to take over the production in which several plants are now engaged, one wholesaler the business of others serving his territory. Many decisions remain to be made on actual operational plans but the British system of contraction is being taken as a guide. The prospect is that where one plant in an industry is assigned to handle the pre-contraction production of five or six plants it will distribute its output on a pro rata basis among the plants from which it takes over and these will be allowed to market the goods under their own names. In cases where variations in the style of a commodity as between different manufacturers does not permit this, study is being given to proposals for the suspension of trade styles and names.

Confusion Still Exists

Efforts of control officials to have those engaged in manufacture and trade indicate the extent to which contraction is possible have caused much confusion and some alarm. The wholesale grocery trade, for example, was asked recently whether it would be able to release from 25 to 80 percent of its manpower to the direct war effort and was asked further whether one wholesale grocery firm for each of the nine provinces could not serve the needs of the country in place of 2000 firms now engaged in the trade. These inquiries, made by control authorities for the purpose of feeling their way, have given rise to fears that contraction was to be on a scale corresponding to proportions mentioned in the inquiries. Such large-scale contractions are not contemplated at this stage.

Design Simplification—To reduce the amount of critical materials going into circuit breakers and simplify their line, Westinghouse Elec. & Mfg. Co. developed four new types, taking the place of 14 old types and saving 38 percent of steel and 18 percent of copper

WPTB Considers Compensation

Wartime Prices and Trade Board is facing up to the problem of compensation for displaced units of industry and trade. It is pretty well settled on a profit pool system after the British pattern. In the only official pronouncement on this angle of curtailment there is an intimation of possible compulsion to effect pooling if business does not adopt it voluntarily. Continuing units of an industry or trade would pay in part of their profits to a pool out of which indemnity payments would be made to closed units.

Ceilings Will Limit Profit

The amount of profit that continuing units would be able to pool would be severely limited by the operation of price ceilings and the expectation is that displaced units would not receive much of anything in excess of enough to cover maintenance expenses of idle plant and perhaps part of capital carrying charges. But for both continuing and displaced firms problem of budgeting for taxes would largely disappear. The part of profits pooled by continuing firms would not be taxable and the firms receiving it out of the pool would not be in a profit position.

Anxiety of Canadian war production heads and the management of war plants is only partly relieved by the War Production Board ruling under which assignment of ratings on PD-1A certificates may be issued by the Ottawa branch of the Board without reference to Washington. The concession is limited to orders amounting to under $500 and will help with small quantities of materials and equipment. Ottawa is still waiting for clarification of Washington policy on the larger phases of allocations and priorities.

U. S. Specializing in Tanks

Development of U. S. war production to the point where large scale output has been reached is causing a shifting of emphasis in Canadian production. Because the U. S., for example, is now producing tanks for the United Nations in a volume to tax transport facilities for getting them to the world's battle fields it is more than likely that Canada will ease out of tank production. Manufacture of other specialized lines may also be slowed down in Canada and replaced by increased output of shells and other more stable lines.

SO BEWARE! BEWARE!

It has been learned that a man using the names "A. Moore" and "A. Yerder" is collecting subscriptions for American Machinist, and other publications, under the trade name of Publishers Service Bureau, 428 Fifth Ave., New York, N. Y.

This man is a fake, and moneys and subscription data he has collected have not been received by this company.

LINES ON AIRCRAFT

WPB's ten percent increase in plane production referred to dollars spent. Wood for planes gains favor of Allies. Aeronautical C. of C. comes upon evil days

Ten percent airplane increase in September over August, as announced by WPB, is somewhat misleading. Actually, the numerical increase was about one-half of one percent. But the Board does explain, in the text of its announcement, that a marked increase in the output of heavy planes and a decrease in light planes, makes the numerical gain very small. The ten percent gain is figured on a dollars basis. Probably it would be about the same figured in pounds. It might be better than the five percent gain in August over July, which was calculated numerically. Most of the heavy output was four-engined bombers. In this category, some companies are ahead of schedule, but the over-all four-engined program is a little behind schedule.

The President explained, at a recent press conference, that in view of our shift to heavier, better-armored, better-gunned planes (and tanks), the unit program has been reduced. It is doubtful, however whether we could have produced his bogey of 60,000 planes this year even if we had stayed on the original balance between heavy and light combat and trainer planes. If we build 50,000 planes this year, we shall have to add 10,000 to the scheduled 125,000 next year—or 135,000—to make the total of 185,000 for 1942-43. That would put us up against the job of producing nearly three times as many planes per month as we are producing now. We still have many new plants to bring into production. And many already in operation can turn out more planes when they get more materials. We might make the poundage equivalent of the 185,000 units as planned, but many doubt we can make the 185,000 in the new program of bigger and more intricate units.

That man is here again—Andrew Jackson Higgins. He left Washington with an order in his pocket for 1200 Army cargo planes, to be built of wood and steel, following more or less closely the Curtiss-Wright plywood cargo C-76, already tested out and in production. Roughly speaking, the C-76 is about the size of the Douglas DC-3 which you ride on the airlines; it has two aircooled engines, and it weighs, empty, around 15,000 pounds. The Higgins plane will not be able to fly the oceans with loads, but it can go empty, and can serve all over the world where fuel stops can be made every few hundred miles.

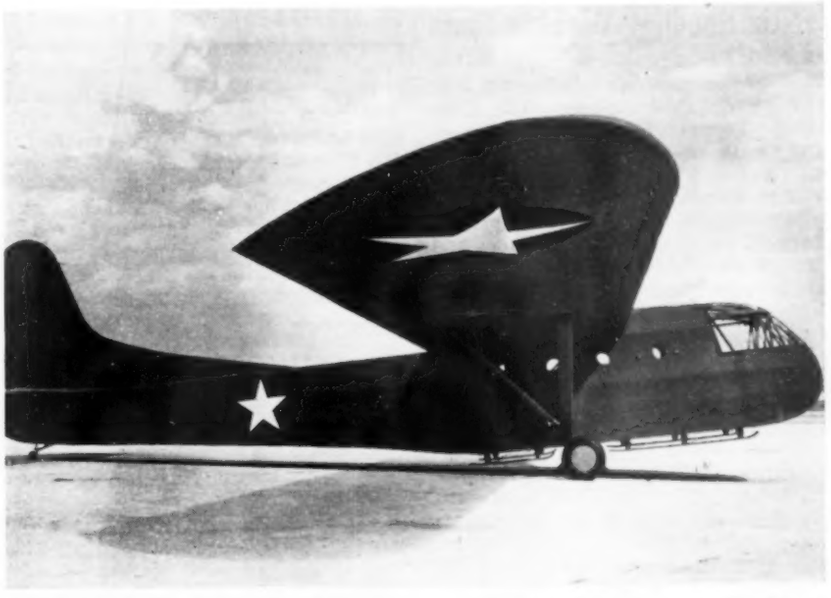
No one expected, two years ago, when we fell over each other getting into aluminum production, that the world air war would turn to wood before the bauxite boys could show their stuff. The first airplanes had all-wood frames; there were plywood airplanes in the World War of 1918; there have been wood and plywood planes ever since; a large part of the Italian air force has been wood all along. Only a few dreamers saw the writing on the wall.

In the last few months, several plywood trainers went into service, with fanfare. Curtiss-Wright proved out the C-76; more band music. Now the British make known they are raiding with the two-engined wooden Mosquito light bomber. (They'd been working on it more than a year.) The Russian's best fighter, the MIG-3, is mostly wood. Britain's Hurricane fighter is half wood, and engineers are seriously considering making the Hurricane and the Spitfire all wood. The terms wood, and plywood, and plastic are all the same thing, meaning plywood impregnated with plastic. It would be an ironic howdydo if we should come long on aluminum in this war.

Dull reading is found in the hearing records of Congressional committees. But we plowed along and came to a statement by James Forrestal, undersecretary of the Navy, that the Consolidated B-24 four-engined bomber once took 700,000 man hours to build, and the figure gradually slid down to 400,000, still going down. The reason, of course, is plant organization and improved line production.

Evil days fell upon the Aeronautical Chamber of Commerce last fortnight. Members met in Washington and considered whether to wash out their old trade association, or clean house and go ahead with it. Col. John Jouett, its president, who had been in the midst of a dog fight for months, promptly resigned and became head man of the aviation division of Andrew J. Higgins industries. He will guide the building of Higgins' plywood transport plane.

You may have noticed, last spring, the California airplane manufacturers organized their own Aircraft War Production Council. That was the overt



Ford Builds Gliders—Nearly as large as a medium bomber, the Ford-built 15-place Waco glider has a fuselage 52 ft. long, a wingspread of 84 ft. and weighs 3,000 lbs. Fuselage is built over a tubular steel framework. Wings are of airplane spruce and mahogany plywood. Skin is cotton fabric. Quick drying of glue joints is attained through simultaneous application of heat and pressure, reducing time from eight hours to five minutes. For contour molding the plywood wing surface, a concrete form lined with steam pipe replaces a steel die. Four months after receipt of blueprints, the first glider was ready

beginning of the Aero Chamber's trouble. Then the west coast members organized their own reporting service in Washington, to give them quickly the daily output of priority and other orders. Next came the eastern aircraft builders, with their own War Production Council. Many members thought the Chamber should have done all those things itself. Membership dues increased, because they are based on output of planes; would have doubled next year. The Chamber's staff grew. The Army and Navy dealt more and more directly with plane producers, minimizing the Chamber's functions. Finally one sheep went over the bridge, and in a few days, nearly all members had resigned. Reorganization, or a new setup, may not come for weeks, because dues are paid to the year-end.

Too many outsiders, was the main complaint of the airframe builders. They didn't like airschool operators, parts makers, and publicity men, muscling in on their technical problems. It is expected all these "camp followers" will be cleaned out. But the trouble goes deeper than that. The airframe builders would like to know just where they stand with reference to the engine and propeller producers. These three industries want to hold together, but they want an understanding. Watch what they do; and also watch the automobile people. They were regarded as outsiders and only one or two of them were admitted as members.

Film Instructs New Workers in Handling Carbide Tools

DETROIT—Designed to expedite the training of new workers in the use, care and handling of carbide tools, Carboloy Company, Inc., has developed and is making available for general distribution a series of six educational 35 mm. silent slide films. Strictly noncommercial in character the films are designed for instructional purposes and are self-explanatory throughout. They are intended to enable users of carbide tools to increase production, save time, reduce tool costs and tool consumption by a proper understanding of all the factors relating to their application.

The complete program of visual education comprises the six films and a copy of each of the films reprinted in a booklet for reference by the trainee following the showing of the film. Distribution will be at print cost, for use as a permanent part of the current war training programs by industrial concerns and educational institutions. Arrangements are also being made for free loaning of films to educational institutions through film libraries maintained by colleges in many states.

The films are based largely on experience gained over several years in the operation of a training course at the Carboloy plant in Detroit where many specialists have been trained.

Washington Appointments

WPB, Regional Offices:

Deputy Regional Directors: William G. Morrison, Dallas; Robert W. Gordon, Denver; Hugo A. Weissbrodt, Detroit; Roy W. Webb, Kansas City; F. Peavey Heffelfinger, Minneapolis.

WPB, Miscellaneous:

Merdecai Ezekiel, executive assistant to Charles E. Wilson, vice chairman in charge of production; Julius Clauss, assistant to Hiland G. Batcheller, chief, Iron & Steel branch; Walter E. Heller, chief, Materials Program branch, Program Coordination Div.

ODT, Regional Offices:

Regional administrative officers: Walter A. Latzer, New York, N. Y.; Robert E. Stufflebeam, Philadelphia, Pa.; John M. Simmons, Atlanta, Ga.; Henry H. Eccles, Cleveland, Ohio; Kenneth W. Lafferty, Kansas City, Mo.; John A. Lubbe, Dallas, Texas; Ralph E. Ellis, Chicago, Ill.; Joseph E. Durand, Denver, Col.; William C. Helvey, San Francisco, Calif.

W. B. Joyce, Duluth, Minn., consultant to the Great Lakes Carriers Division. Harrison J. Hart elected chairman Seattle Coastwise and Intercoastal Carriers' Advisory Committee to replace Alex M. Peabody, resigned.

BUSINESS ITEMS

Baker Brothers, Inc., has appointed Van Dyck Churchill Co. of New York City as its exclusive representative in the New York territory.

Grobet File Co. of America, distributors of Swiss pattern files and rotary files, has announced removal to larger quarters at 421 Canal St., New York City.

Announcement has been made of the formation of the Aircraft Parts Development Corp., with offices, laboratories and shop in Summit, N. J. This organization will handle research and development work on parts and materials for the aircraft industry, especially in the fields of fastening devices, powdered metals and plastics.

"AR"-marked parts of Wheelabrator airless abrasive blast cleaning unit, when so worn as no longer to give maximum efficiency, may be returned for rebate at ten cents per pound, f.o.b. American Foundry Eqpt. Co., 555 S. Byrkit St., Mishawaka, Ind.

Westminister Iron Works, New Westminister, B. C., has erected a new building at its plant on 10th St. and taken over a warehouse and two adjoining lots on Columbia St., where it is establishing a pattern shop and installing new machinery. In addition to the construction of component parts for B. C. shipyards, the firm is also turning out anchor winches in large quantities.

Hamilton Standard Propellers Div. of United Aircraft Corp. is operating a branch plant at Pawcatuck for repair of airplane propellers.

United Precision Products Co. has announced that it is now located at 3524 W. Belmont Ave., Chicago.

Ecco High Frequency Electric Corp., will shortly occupy its new plant at Hudson Blvd. and 70th St., N. Bergen, N. J.

NAMES in the NEWS

Dr. William Monroe White has retired as manager of the hydraulic turbine department of Allis-Chalmers Mfg. Co. and will be succeeded by J. Frank Roberts, head hydraulic engineer of Tennessee Valley Authority. H. P. Binder has been selected as manager of the centrifugal pump department. During Dr. White's 31 years of service with the firm he engineered some of the largest hydro-electric installations in the world including Niagara Falls, Boulder Dam and TVA. Mr. Roberts has been with the organization since 1919, and served as office manager in the hydraulic department until 1927 when he left to join a Canadian utility, and later became affiliated with the TVA. Mr. Binder has been assistant manager of the hydraulic department, in charge of centrifugal pump sales and engineering, since 1940.

E. P. Barry has been named coordinator of plants for the Chicago Pneumatic Tool Co. and will supervise machine equipment, tool designing and production methods for the company's four plants. He was formerly connected with Glenn L. Martin Co.

Charles F. Wagner and Dean Harvey have been awarded the Westinghouse Order of Merit by Westinghouse Electric & Mfg. Co. for outstanding contributions to the electrical industry. Mr. Wagner, manager of central station engineering at the East Pittsburgh works, was honored for his lightning studies while Mr. Harvey, materials and standards engineer, was cited for his contribution to the war effort as a member of the Conservation Div. of WPB. Each man was presented with a certificate of honor and a bronze medal.

T. E. Tillinghast has been elected president of the United Aircraft Service Corp., a subsidiary of Pratt &

Whitney Div. of United Aircraft Corp., to succeed Eugene E. Wilson, who is president of the parent company. Mr. Tillinghast has been connected with the organization since 1929.

Charles E. Hart has been named president of Chase Brass & Copper Co. He joined the company in 1924 and has been executive vice president since 1938.

Felix A. Schagelin has been appointed assistant to W. Austin Commerdinger, vice president in charge of production, Byrne-Mitchell & Co., New York City. His appointment as chief engineer of Industrial Electronic Corp. of Brooklyn, N. Y., has also been announced.

Allen P. Livar has been appointed chief engineer of the Airtemp Div., Chrysler Corp. He is a veteran in the heating and air conditioning industry and has been chief heating engineer of Airtemp Div. since 1937.

Awarded Howe Medal

W. A. SCHLEGEL

Dr. A. M. Hageman has been made general engineering manager of Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J. Dr. Hageman was formerly in charge of lamp engineering.

John B. Jenkins has been named manager of the Hydraulic Div. of Twin Disc Clutch Co., at Rockford, Ill. For the past eight years he has been in charge of the company's factory branches at St. Louis, Tulsa and Dallas.

W. A. Schlegel of the metallurgical department, Carpenter Steel Co., was awarded the Henry Marion Howe gold medal by the American Society for Metals for his technical paper on "Surface Carbon Chemistry and Grain Size of 18-4-1 High-Speed Steel."

Allis-Chalmers Managerial Changes

W. M. WHITE

J. F. ROBERTS

H. P. BINDER

Charles C. Chamberlain has been named general sales manager of Jenkins Bros., valve manufacturers. He has been connected with the company since 1929.

B. O. Austin has been appointed control section engineer at the Lima Div. of Westinghouse Electric & Mfg. Co., with responsibility for design and development of specific war equipment.

George B. Shaw has been recently appointed sales engineer of Keystone Carbon Co., and will devote his efforts to promotion of Keystone negative temperature coefficient resistance material.

Edward L. Robinson has been made assistant to the manager of the Metallurgical Div., Carnegie-Illinois Steel Corp., Pittsburgh district.

Charles D. Young, formerly district manager of Metal & Thermit Corp. at Chicago, has been appointed sales manager of the Welding Div. with headquarters in New York City. Merritt L. Smith has been named assistant sales manager in addition to his direction of advertising activities.

H. Keim, vice president in charge of operations of Oil Well Equipment Co. on the Pacific Coast, has been transferred to the manufacturing headquarters at Oil City, Pa.

E. C. Perley has been appointed director of the Tank Production Branch, Department of Munitions and Supply at Ottawa, Can.

Earl Wesselhoff has been named manager of the Boston branch of Morse Chain Co. and will serve the company throughout the New England States.

A. E. Shelton, formerly works manager of the Stimson Div. of Vultee Aircraft, Inc. at Detroit, has been made division manager, a newly created position.

Honored With Westinghouse Order of Merit

C. F. WAGNER

DEAN HARVEY

Vultee Manager

A. E. SHELTON

Named General Motors Vice Presidents *Council Executive*

ALBERT BRADLEY

ORMOND E. HUNT

I. S. RANDALL

Albert Bradley and Ormond E. Hunt have been elected executive vice presidents of General Motors Corp. Mr. Bradley joined the staff of General Motors Corp. shortly after he left the United States Army in May, 1919. He is executive assistant to the president and also a member of the board of directors and of the corporation's policy committee and war administration committee. Mr. Hunt was chief engineer in charge of Liberty aircraft engine design and production for the United States Government, during World War I. He is a director and a member of the war administration and policy committees.

Thomas H. Corpe has been named general sales manager of Elastic Stop Nut Corp. He was formerly assistant general sales manager of Lockheed Aircraft Corp. and was associated also with General Motors Corp.

Gerard Swope, president of General Electric Co., has been selected to receive the Hoover Medal for 1942 in recognition of his constructive public service in the field of social, civic and humanitarian effort.

I. S. (Stick) Randall, assistant to the chairman of the board of Transcontinental & Western Air, Inc., has been appointed general manager of the newly formed Aircraft War Production Council, East Coast, Inc.

OBITUARIES

Charles H. Norton, 91, noted inventor and long associated with Norton Co., Worcester, Mass., passed away at his home in Plainville, Conn. He first became affiliated with the company in 1900 as designer and chief engineer when the Norton Grinding Co. was founded by the Norton Emery Wheel Co. When the grinding company was merged with Norton Co. in 1919 Mr. Norton became chief engineer of the machine division. He has not been actively associated with the company for several years because of his advanced age. Mr. Norton is credited with having made one of the greatest contributions by any individual to American mass production methods, in his invention and development of precision grinding.

Henry D. Hibbard, 86, consulting engineer, died at his home in Plainfield, N. J., recently. Mr. Hibbard was active in the production and study of steel making processes.

Reginald F. Jopling, 76, former vice president of American Steel and Wire Co., died in Cleveland recently. He became a consulting engineer when the company was taken over by United States Steel Corp. a number of years ago.

Fred P. McBerty, 73, passed away following a three month's illness. He was retired as head of the Federal Machine & Welder Co.

George A. Goss, 61, vice president and a director of Scoville Mfg. Co. recently passed away.

Daniel A. Keating, plant superintendent of the Stanley Works, died recently at the age of 73. He was a well known inventor and among his numerous inventions have been the first detachable automobile rims, sheet metal ball bearing for bicycles, and designer of the steel automobile body.

Nelson J. Darling, 58, died after a long illness. He was manager of the General Electric Co. plants at Lynn and Everett, Mass. He joined the G. E. test course as a student engineer after graduation from Cornell in 1907. After working in the railway engineering department at Schenectady he was transferred to the Erie works and became assistant manager of the plant in 1918, and in 1922 joined the River works.

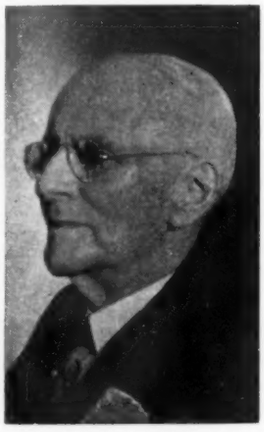
Carl W. Blossom, who recently passed away at the age of 61, was president and founder of the Cleveland Hobbing Machine Co. organized in 1926. He was a director of the Enamel Products Co., Standard Tool Co., Nestle-LeMur Co., Brown Fence Co. and Nelson-Baker Co.

MEETINGS

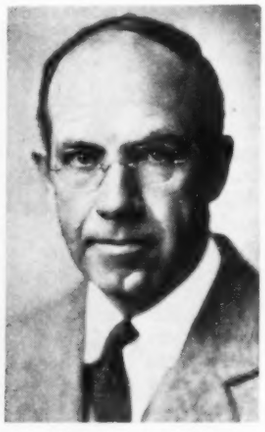
American Society of Mechanical Engineers. 63rd Annual meeting. Hotel Astor, New York, N. Y. Nov. 30-Dec. 4.

National Association of Manufacturers. Annual meeting. Waldorf Astoria Hotel, New York, N. Y. Dec. 2-4.

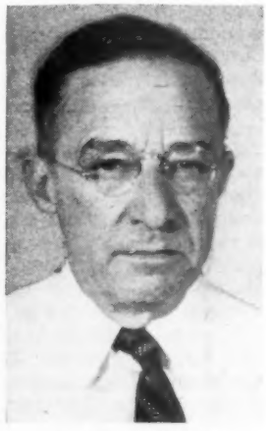
National Exposition of Power and Mechanical Engineering. Madison Square Garden. Nov. 30-Dec. 4.



CHAS. H. NORTON



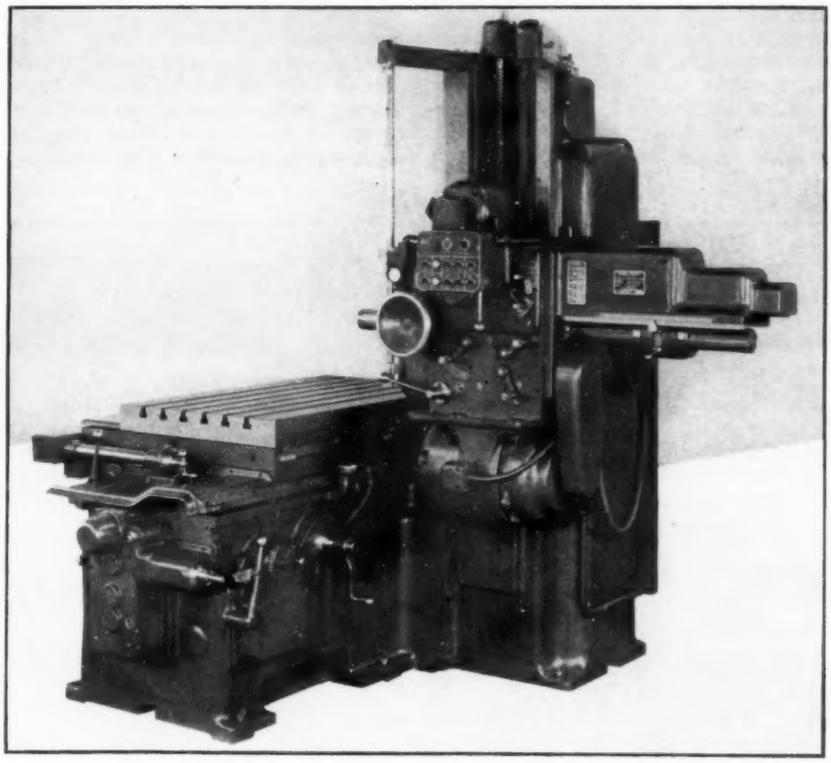
N. J. DARLING



C. W. BLOSSOM

SHOP EQUIPMENT NEWS

DeVlieg Builds Jigmil Which Combines Functions Of Horizontal Boring Mills and of Jig Borers



To serve the combined functions usually performed on horizontal boring mills and jig borers the Jigmil has been announced by the DeVlieg Machine Company, 450 Fair Ave., Ferndale, Mich. This machine has the spacing accuracy of a jig borer, performance qualities of a milling machine, and the convenience and flexibility of a horizontal boring mill.

The principal novelty in this machine is a new arrangement of basic structure and slide elements that comprise a heavy bed with a fixed bolted and doweled relation to the column. The bed slide is at 90 deg. to the center of the spindle and is of sufficient length to adequately support the saddle for its full length of travel. Thus, the two basic slides, on which all accuracy depends, have a fixed relation. The slides are all of V and flat, narrow guide construction. Both the head and saddle are provided with double wedge taper gibs.

The operation of a pushbutton unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, the operation of a single pushbutton will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically, ready for the cutting operation. Uniformity of the selected position for stopping and locking is dependable within 0.0002 and the position is adjustable to the full range of its travel and provided with selective means having micrometer graduation.

The spindle carries a 3 in. Nitralloy bar, has a flange nose on the sleeve for mounting face milling cutters and standard No. 5 Morse taper in the bar. The bar has 15 in. of automatic power feed for boring with provision for an extra 5 in. by resetting. The spindle has twelve quick change speeds from 30 to 800 r.p.m. The bar is provided with six quick change feeds from 0.003 to 0.030 in. per revolution. The bar is provided with power feed and rapid traverse in both directions operated by a single lever extended downward from the master switch box. A micrometer dial indicates the endwise movement of the bar and is graduated in thousandths with the movement obtained by a leadscrew. The spindle head is driven by an independent motor in a manner to eliminate all of the driving shafts customarily used on horizontal boring machines.

The master switch is carried on the spindle head and controls all of the functions of the machine, enabling the operator to fix his vision on the cutter and maintain finger tip control.

There are twelve quick change feeds from 0.5 to 22 in. per minute so that the milling functions can be correctly fed in inches per minute.

The machine has five motors, a 5 hp. for the main spindle drive, a ⅛ hp. for the bar rapid traverse, a ½ hp. for the feed, a 1½ hp. for the rapid traverse and a ½ hp. for the automatic table positioning. All motors are controlled and coordinated by a main control panel.

The table dimensions are 48 in. long × 30 in. wide with six T slots. The horizontal travel is 48 in., the vertical travel of the spindle head 37 in., from center line to 1 in. below table top to 36 in. above the table. The retraction movement of the table is 14 in.

Acromark Hercules Type Holder Used for Limited Area Marking

Acromark Corp., 9–13 Morrell St., Elizabeth, N. J., has brought out a Hercules curved line type holder for marking metal parts in the limited areas. This heavy-duty stamping tool is made from one piece of shock resisting alloy tool steel and supplied either with a press shank or hand style to fit the hand for striking with a hammer.

Each piece of type is of segment

shape and has the heavy shoulder feature to give increased strength. All characters are engraved in an open Gothic style with a strong bevel and are tapered to face for maximum strength.

Progressive Develops Temp-A-Trol Forge Welder Which Combines Spot Welding and Heat-Treating

Important changes in production technique for fabricating armored vehicles, ships and other items built of plates may be based upon development of the Temp-A-Trol forge welder by the Progressive Welder Co., 3050 East Outer Drive, Detroit, Mich. This machine was revealed at the National Metals Exposition.

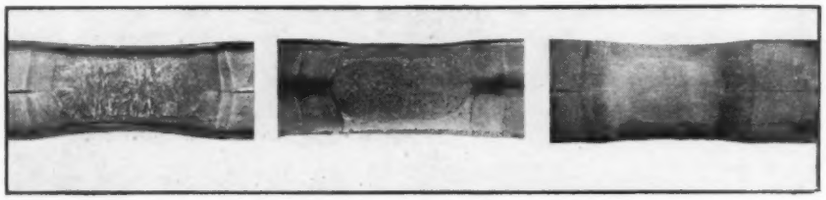
Jigging practices for armored-vehicle production are likely to be simplified because plates are merely overlapped to make spot welds, more than one machine may be positioned about the vehicle, even portable units may be utilized where needed. Total production time per weld on medium-tank assemblies is estimated at 30 sec., including cleaning. With redesign of ship components to permit use of forge welding, the advantages of speedier construction and a saving in weight may be secured.

The outstanding feature of this spot welder is the control by which the machine automatically compensates itself to reproduce welds of identical quality under wide ranges of variation in metal thickness, cleanliness of metal and other welding conditions. In other words, the weld is not completed until the proper temperature is secured, regardless of the material which is being welded.

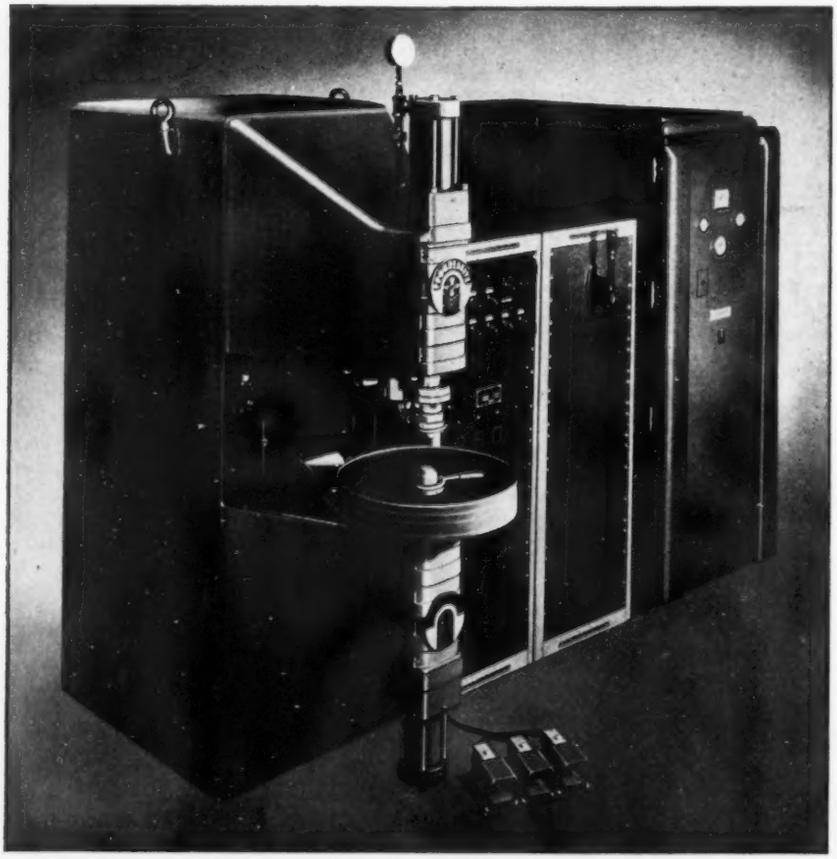
Basic element of control which makes this possible is incorporation of a highly sensitive thermocouple in one of the refrigerated electrodes. The thermocouple is connected to a control cabinet containing highly accurate electronic pyrometer controls, which can be set to produce a complete heat-treating cycle for the weld metal, as well as to establish correct welding temperature during the initial phase. The thermocouple has a slip joint so that the electrode tip can be removed for redressing, and the mounting of the thermocouple end in the tip is such that the latter can be redressed a number of times. This operation can be done without affecting the accuracy of the temperature measurement.

A typical control panel carries six temperature dials operating in automatic sequence. They are arranged to produce automatically almost any desired combination of welding and heat-treating cycles. Most common cycle is: (1) weld, (2) cool below the critical, (3) reheat for grain refinement, (4) cool, (5) reheat for tempering, and (6) cool. Cooling temperatures may be alike, or not, as required by the steel being welded. As many as five individual heats and one common "cool" can be secured by setting the controls.

When the machine is started, electrodes come together with proper pressure, pulsating current gradually increases. At the instant when correct welding temperature is reached, the current is shut off, electrode pressure is increased to produce forging action,



Three stages in producing a heat-treated weld by means of Temp-A-Trol. At left—coarse grain structure in the weld nugget, characteristic of spot welds in heavy sections. Center—refined grain structure achieved by the first post heat. Right—appearance of the weld after tempering



In the Temp-A-Trol forge welder the weld is continued until the proper temperature has been secured

cooling jets are turned on to expedite cooling. When the temperature of the weld metal drops to a predetermined value, the cycle is repeated to attain proper temperature for grain refinement, and then once more for tempering to remove weld brittleness.

By relying upon a continuous indication of temperature at the weld metal, by means of a thermocouple, the factors that commonly interfere with welds of uniform quality are cancelled out. No attention need be paid to variations such as these: (1) resistance of varying metal thicknesses, (2) induction losses as the material enters the throat of the welder, (3) short-circuiting losses through previously completed welds, (4) increase in electrode contact through mushrooming, and (5) presence or absence of scale on the work. Without changing the controls, welds of the same quality can be produced in ¼ to ¼ in., 3/16 to ¼ in., and ¼ to ⅜ in. or in three sections of ¼ in. material at the same time. Machine ratings depend upon power equipment supplied, but at least ½ to ½ in. can be spot welded with this machine.

The Temp-A-Trol feature was made possible through a prior development—refrigeration of the electrodes by brine cooled in a Frostrode cabinet. In this case, refrigeration made feasible the incorporation of the thermocouple in the electrode, in addition to minimizing mushrooming of the tips under heat and pressure.

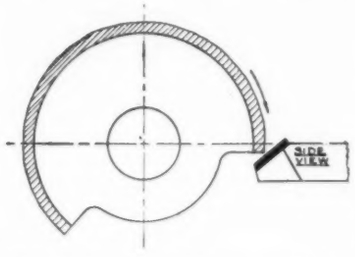
DO'S AND DON'TS FOR OPERATORS USING CARBIDE TOOLS

Carbide tools are as easy to use as ordinary types of tools. However, because carbide tools are extremely hard—and therefore more "brittle" than steel tools, certain requirements are necessary in order to protect the carbide tip while in use. When properly used, carbide tools will give you long, continuous periods of cutting, they provide high quality finish, extreme accuracy, and freedom from frequent tool changes. Here are some of the things you can do to get the most from your carbide tools.

Handy charts containing these hints are available free on request.

New Standard-Design Shear Type Tools

For interrupted cuts on large forgings and castings, the standard-design shear type Carboloy Cemented Carbide Tool illustrated has several outstanding advantages. Designed to protect the carbide tip on this heavy work, this tool takes the



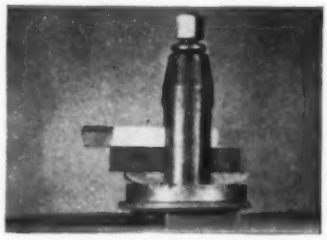
initial load at a point some distance behind the nose, where the tool is stronger. The heavy shear angle causes the cutting edge to literally "slice" into the work, thus reducing impact to a minimum. See new catalog GT-142, page 9.

Standard-Design Tools Save Delivery Time

To enable you to order by tool number and eliminate delays for drafting, blueprints, quotations, etc., Carboloy Company now makes available a large selection of standard-design tools. These are former special tool styles for which there previously has been a large demand within a narrow range of minor design variations. Standard designs for these have been established to broadly meet most previous requirements. Standard-design tools represent one of several time-saving features described in the new catalog GT-142. Send for your copy.

◀ When using holders, use special ones designed to hold carbide tool on a horizontal plane—not tilted upwards.

Don't tilt rocker ▶ holders up. Keep tool level and shim up to centerline. Better yet, turn tool post collar upside down to get flat surface.

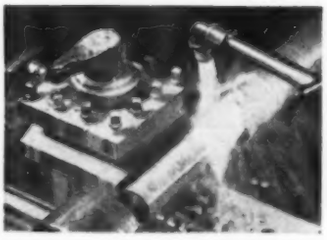


◀ Don't hammer cutting edge of carbide tools. Blows cause chipping. If necessary, tap tool from rear to bring up to work.

Avoid excessive ▶ tool overhang. It should be no more than necessary to allow work clearance and chip room.

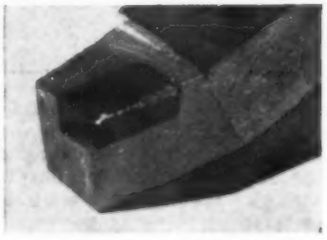
◀ Don't use sharp-pointed or cup-type screws. Grind them flat—using the flat face of a cup-type grinding wheel.

When a coolant is ▶ needed—use a *heavy* flow directly onto tool. During tool adjustments, avoid turning coolant on and off. If necessary run first piece dry.



◀ *Always* disengage feed first before stopping machine. Never stop tool in the cut. This will cause tool breakage.

Remove tool be- ▶ fore it becomes excessively dull, or chipping may result. Best way is to remove tools for sharpening at regular intervals.



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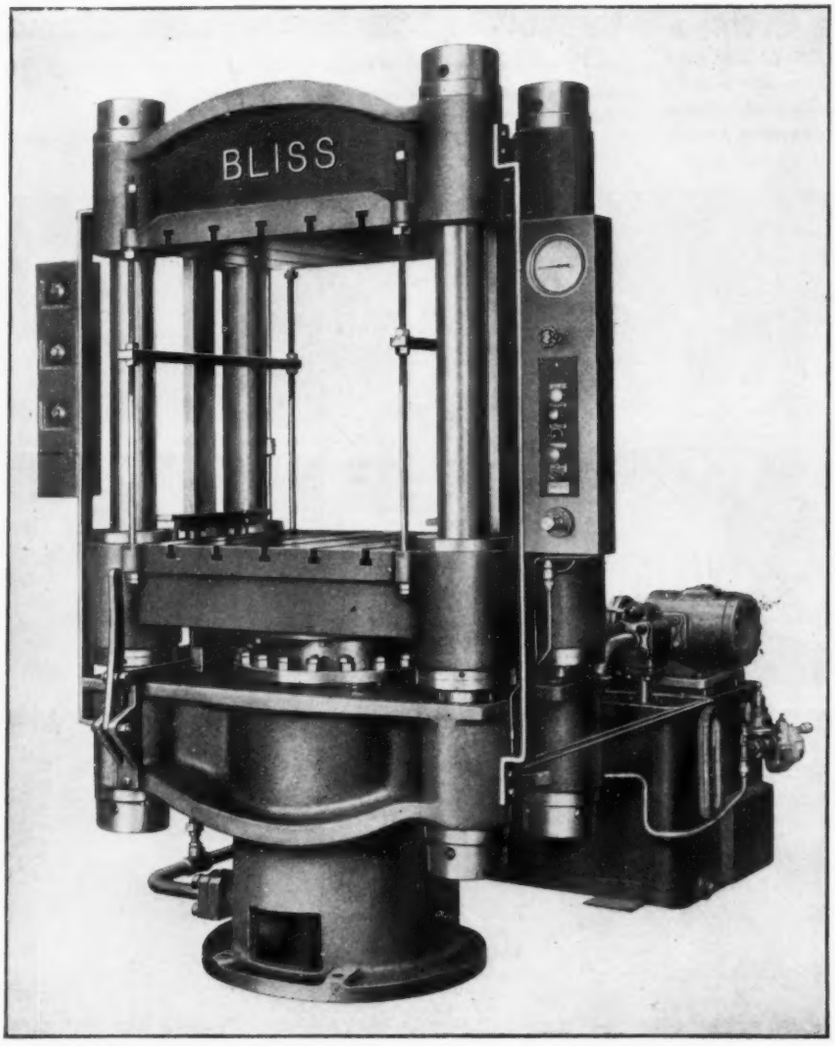
Bliss 250-Ton Semi-Automatic Hot Molding Press Has Completely Electrical Timed Cycle Control



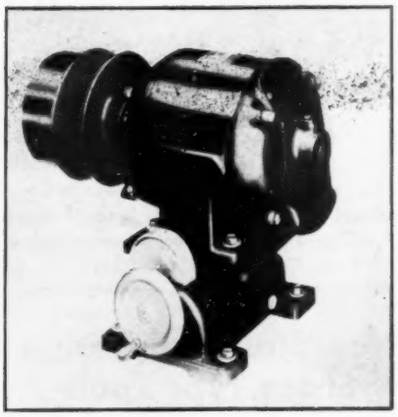
E. W. Bliss Co., 53 St. and Second Ave., Brooklyn, N. Y., has announced a 250 ton hydraulic molding press of the semi-automatic hot molding type with a completely electrical timed cycle which permits independent adjustment of the lengths of preliminary cure, gassing period and the final cure. A variation of this control provides independent timing of a chilling period if required, and of the flushing of the mold passages at the completion of the cycle.

The ability to change from the quick advance speed to the pressing speed before contact insures entrance into the mold at a slow speed. Patented guiding allows expansion of the heated platen but maintains accurate guiding of the platen on the rods by means of bronze bushings with close clearance. Pressure is adjustable over at least a ten to one range. The automatic cycle may be stopped in any portion of its cycle by the emergency stop button.

The pumping unit has no mechanical connection with the press and can be placed some distance from the press or immediately behind the press.

Powermatic Variable Drive Has Governor Speed Control

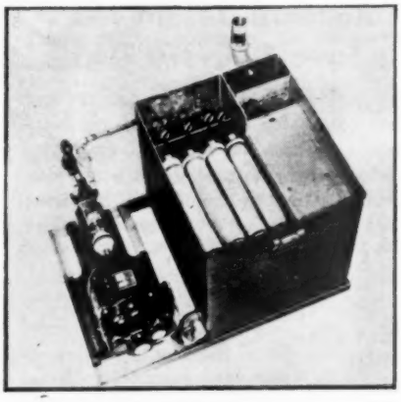
A variable speed drive which incorporates the governor principle of power control has been introduced by the Powermatic Machine Co., 659 S. Anderson St., Los Angeles, Calif. in development of the Powermatic drive unit. The speed may be instantly regulated by increments of a fraction of an r.p.m. The smooth, slipless variation in speed provides infinite regulation over the entire range without intricate electrical control. The driven machine is always started in the low speed high-torque position regardless of the speed control setting when stopped. Upon starting the motor the drive accelerates to the preset position. The speed control may be preset before starting the motor or adjusted to any position desired while in operation. Flexible power is transmitted from the Powermatic drive through a variable drive belt to a V- or a flat-driven pulley.



The drive is equally efficient on loads of greatly varying magnitude. It can be used for jogging duty, for slowly bringing the driven machine up to the required speed or to instantly accelerate the load to any desired speed from minimum to maximum.

Schurs Klenzstream Oil Filter Removes Chips, Dirt From Oil

For the removal of chips, coarse dirt and fine abrasive particles as well as gummy oxidized elements from cutting oil or coolant Schurs Oil Burner Co., 4216 Long Beach Ave., Los Angeles, Calif., has introduced the Klenzstream oil filter. The oil which has been used flows from the drip pan of the machine through a pipe into a well in the unit, then into the bottom of an adjoining compartment and advances upward, progressively filling a series of removable trays into which the heavy chips settle out of the oil. The cooled oil overflows into another compartment where it passes through special fabric covered filter units which remove all foreign matter. The oil then flows through a system of outlet valves into the clean oil reservoir, from which it is withdrawn for re-use through a floating suction element by the circulating



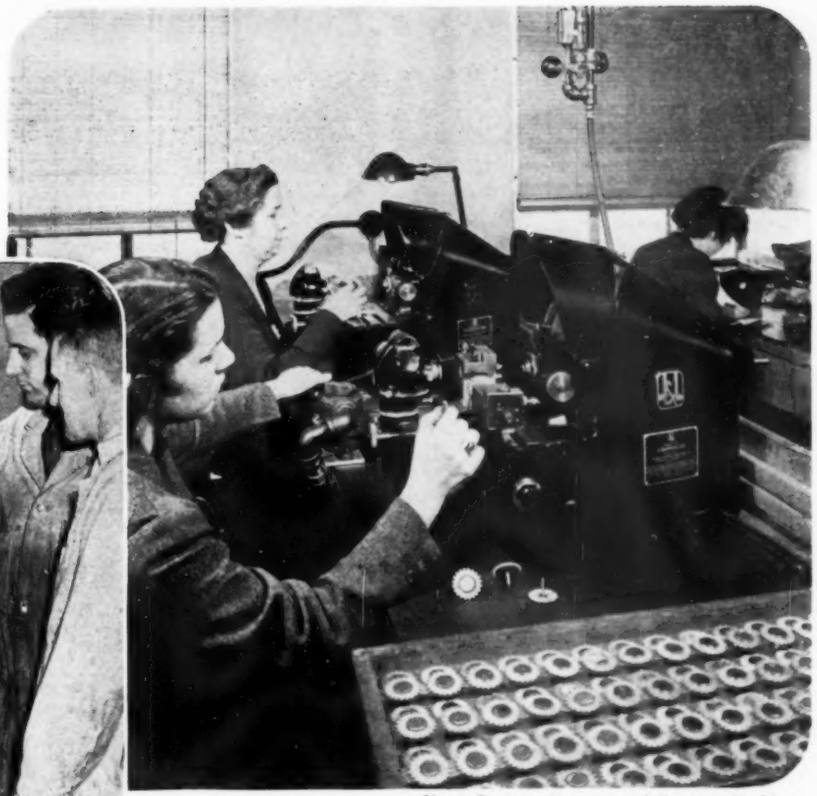
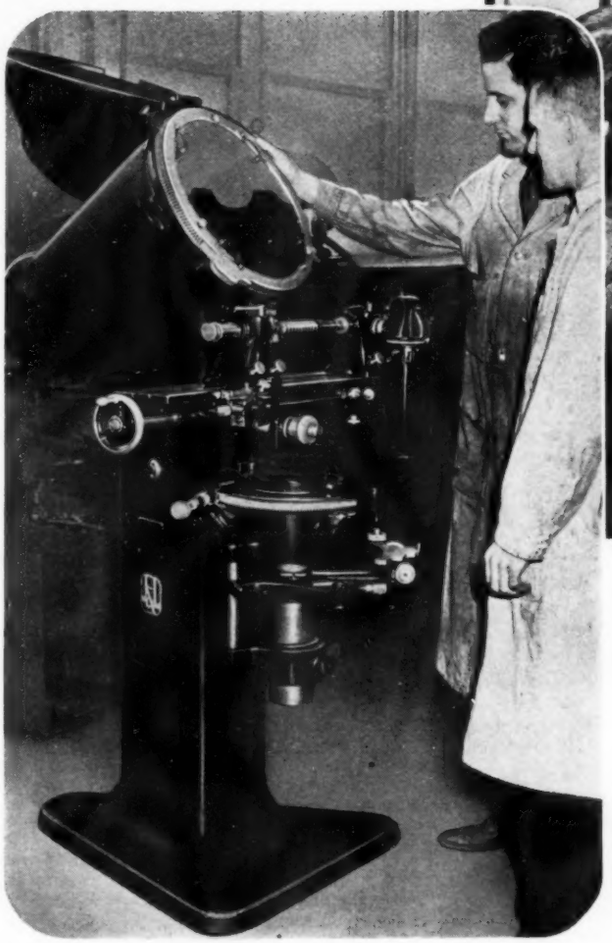


Photo Courtesy International Business Machines



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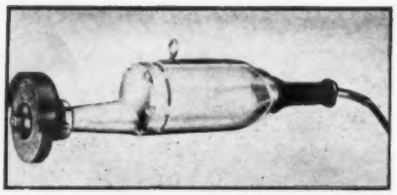
pump. This pump can be operated on the machine or separately. The filter can be cleaned without stopping the machine or ceasing operation of the unit.

Skilsaw Portable Grinders Built to Eliminate Vibration

Two new portable grinders have been added to the line of electric tools made by Skilsaw, Inc., 5033-43 Elston Ave., Chicago, Ill. The Model AD is a 4 in. unit and the Model AE is 5 in. They are designed to meet high-speed requirements on all grinding, wire brushing, polishing and buffing operations.

Ball bearings mounted in steel inserts on armature and extreme ends of the wheel spindle absorb thrust, eliminate vibration and insure cool operation. The commutator and switch



are fully inclosed for protection against dust. Straight line ventilation blows dirt away from the operator and prevents clogging. Steel gears, heat-treated for long life and spline-mounted on shafts, are strong and quiet. The rubber sleeve handle provides a firm grip.

The AD model is 22 in. long and weighs 15 lb., operates at no-load speed of 4,500 r.p.m., driving a grinding wheel $4\times\frac{3}{4}\times\frac{1}{2}$ in. The Model AE grinder has a grinding wheel $5\times\frac{3}{4}\times\frac{1}{2}$ in. and operates at 4,200 r.p.m., weighs 18 lb. and is $22\frac{5}{8}$ in. long.

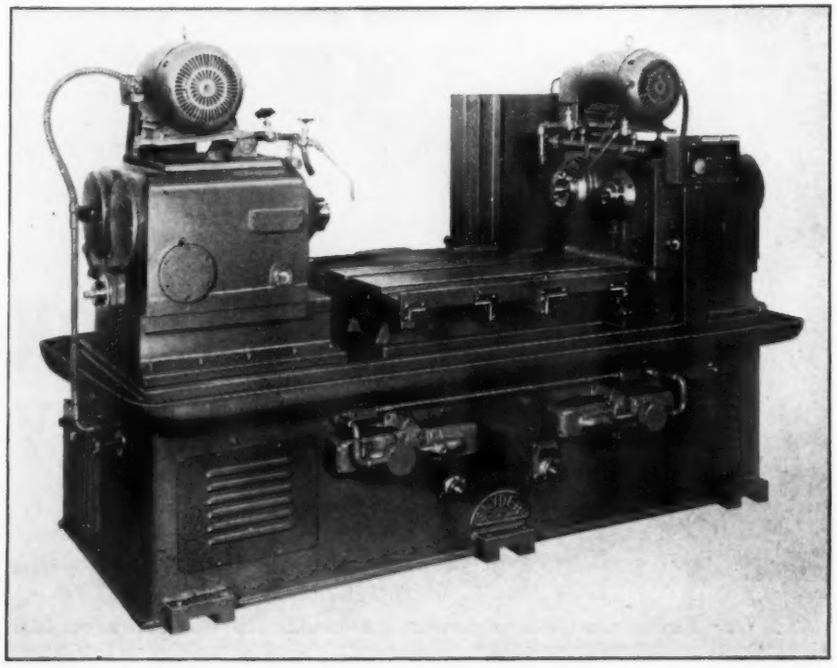
Snyder Double End Facing and Centering Machine Takes Work Length Ranging From 12 to 44 In.

A heavy duty, double end facing and centering machine has been produced by Snyder Tool & Engineering Co., 3400 East Lafayette St., Detroit, Mich., which will take work length ranging from 12 to 20 in., 20 to 28 in., 28 to 36 in., and 36 to 44 in. The machine consists of two units, each equipped for milling and centering, and is hydraulically operated and electrically controlled.

The milling spindle is worm wheel driven and is mounted on roller bearings. The centering spindle is ball bearing mounted and is of quill type construction, the quill having hydraulic feed. All moving parts are lubricated by an oil pump from an inbuilt reservoir. The cutting range for milling is 3 to 8 in. and center drills may range from 5/16 to ¾ in.

In operation the fixture and slide move in rapid traverse away from the operator and feed the work between the two milling cutters. After the work piece has been faced to length, the slide returns to the original position opposite the centering drills. The centering tools are then fed into the work and the return of these tools to starting position completes the cycle.

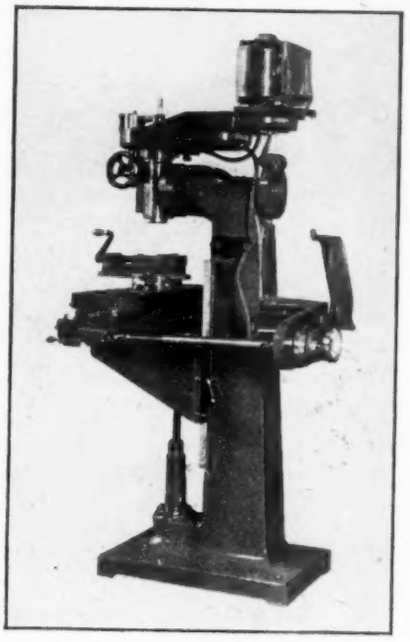
The welded steel base of the machine incloses the hydraulic equipment, etc., and adjustable trip dogs. The coolant is contained in an auxiliary tank in the rear of the machine with a removable chip tray cover.



Vernier Reading Made Easier On Blank & Buxton Index Mill

Changes in design have been made in the index mill produced by Blank & Buxton Machinery Co., 3100 East Michigan Ave., Jackson, Mich. The vernier mountings are placed on an angle instead of being mounted straight up and down. The cross vernier has been moved from the front of the knee to the back for easier reading.

Another added feature is power feed to the spindle. An area 8×16 in. can



be milled, drilled and bored at one setting. The machine is recommended for end mills up to ⅝ in. in tool steel, but is also used on many jobs with larger cutters. The head swivels 90 deg. either way. Standard index mills have six spindle speeds available ranging from 180 to 2,400 r.p.m., while special models have twelve speeds ranging from 120 to 3,700 r.p.m.

Snap-Lock Control Switch Made In Flush or Box Type

Built for compactness and stability the Snap-Lock control station switch has been developed by National Acme Co., 170 E. 131st St., Cleveland, Ohio, to meet most heavy-duty service requirements. Standard assemblies consist of 3, 2 or 1 button combinations furnished either in flush type for mounting in standard cavity, or box type for surface or pendant mounting. Push or turn type station buttons are optional and all of them are interchangeable to suit convenience of individual requirements. The casing of the switch is molded of heavy dielectric plastic material and is highly resistant to oil, dust and moisture. The heavy, wide-faced, coin silver contacts are self-wiping on both make and break action. The push mechanism is closely fitted in

"SHANGRI-LA"

From the assembly lines of America's giant aircraft factories roll the bombers that are blasting the way to Victory. Huge hydraulic presses, capable of exerting pressures up to 5,500 tons, feed a steady supply of parts to the assembly floor. Here is "Shangri-La" in fact.

Scores of hydraulic presses built by Baldwin Southwark have taken their places on aircraft production lines. Many more are at work producing propellers, tires, self-sealing gas tanks, and plastic parts as well as sub-assemblies for other suppliers to the aircraft industry.

Many of the improvements in airplane design have been made possible by Baldwin Southwark physical testing machines and instruments. Every major plane manufacturer in the country uses testing equipment produced by Baldwin, including machines so powerful they pull metal apart, instruments so small they weigh only a small fraction of an ounce.

Information and illustrations on this Southwark equipment are contained in two bulletins available on request. For data on hydraulic presses, No. S-160; on testing machines, S-161.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representatives, The Pelton Water Wheel Co., San Francisco, California.

BALDWIN

Southwark

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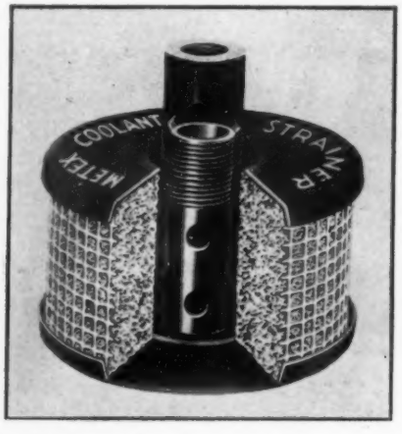
the housing, with 1/16 in. cushioning overtravel, and passes through the mechanical side only, thus eliminating the chances of electric shock to the operator from a flash-back. Weight of this switch is 6⅛ oz.

Snap-Lock units can be arranged in combinations to produce control station assemblies that will handle as wide a variety of functions as may be required.

Metex Chip Coolant Strainers Are Available in Three Sizes

Three sizes of the Metex coolant strainer have been made available by the Metal Textile Corp., 4 Central Ave., Orange, N. J. It is suitable for use in straining metal cuttings and chips that remain in suspension on turret lathes, screw machines, milling, drilling and other metal cutting machines using a coolant flow. The Model B is designed for shallow sump tanks, milling and small automatic screw machines, and has a capacity up to 5 gal. per min. The diameter is 3 in., height 3½ in., including nipple.

Model C size is adaptable to most machines and especially suitable for deep, narrow sump tanks. The overall diameter is 5 in., height 4 5/32 in. with



nipple, and a ¾ in. pipe and nipple, capacity up to 10 gal. per min.

The Metex Model D strainer has twice the straining surface of the Model C and is used for deep narrow sump tanks also. The diameter of this unit is 5 in., height 7 in. including nipple, and ¾ in. pipe and nipple.

Every drop of coolant passes through multiple layers of interstitial knitted and crimped mesh which can be replaced in about a minute.

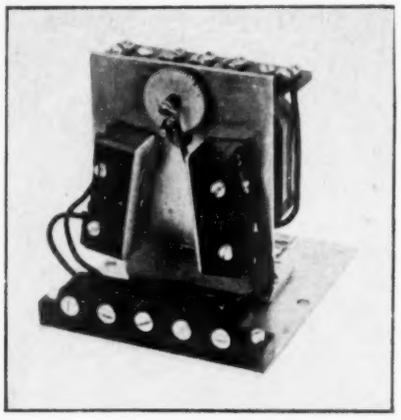
Trabon Electric Barrel Pump Provided With Lifting Bail

Introduction of a new Series H electric-hydraulic barrel pump has been made by Trabon Engineering Corp., 1814

E. 40th St., Cleveland, Ohio. The pump is fully inclosed and sealed against the entrance of air and mounted rigidly on a flanged head. The flange fits over a standard 55 gal., 400 lb. drum, permitting oil or light, medium or heavy grease to be pumped from the original container without rehandling. A lifting bail is provided which allows easy transfer from one drum to another with a hand hoist or lifting bar. The use of a non-compressible oil as a pumping agent assures discharge of the full rated capacity of the pump at all times whether the pressure head is high or low. An extension cord plugged into an electric outlet provides operation of the unit.

This pump is operated with a ½ hp. motor connected to the hydraulic pumping unit which is located in the bottom of the hydraulic reservoir. Oil from the reservoir is pumped through a reversing mechanism which operates a double-acting piston. The lubricant is discharged on both the up and down strokes thus maintaining a constant, continuous discharge. The operation of the pump is usually controlled with the automatic pressure switch.

Since three sizes of pumping units and two sizes of piston reversing mechanisms are available, the pumps can be furnished in six different discharge capacity and pressure combinations.



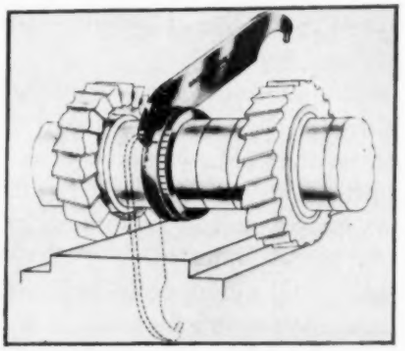
Barber-Colman Motorelay Used in Current Control

A motorelay for use with any floating contact device in applications where the control current exceeds the contact rating of the control instrument has been brought out by Barber-Colman Co., Rockford, Ill. The construction of the unit includes a shaded pole, reversible geared head motor, totally inclosed switches and switching mechanism. Switch contacts have a non-inductive load capacity of 10 amp. at 110 or 230 volts a.c. The control circuit current is 0.35 amp. at 25 volts. An inclosed type steel cover is available.

Dayton Rogers Spacing Collars Now Have Adjusting Wrenches

Micrometer adjustable spacing collars made by Dayton Rogers Mfg. Co., Minneapolis, Minn., are equipped with an adjusting wrench as part of the equipment included with the eleven different sizes for miller cutter arbors.

These double-end pin spanner wrenches are adjusted by untightening



the cutter arbor nut and adjusting the spacing collar to the desired position governed by the graduated micrometer sleeve and turning the collar to the desired direction as engraved on the outer sleeve of the micrometer barrel, thus overcoming hand adjustments.

AN AUTOMATIC CYCLE for Your Job!

The full range of automatic cycles shown are standard and each cycle is obtainable front or rear. The front and rear cycles can be used simultaneously or independently and require no cams or special attachments.

Awarded Navy "E" March 6, 1942

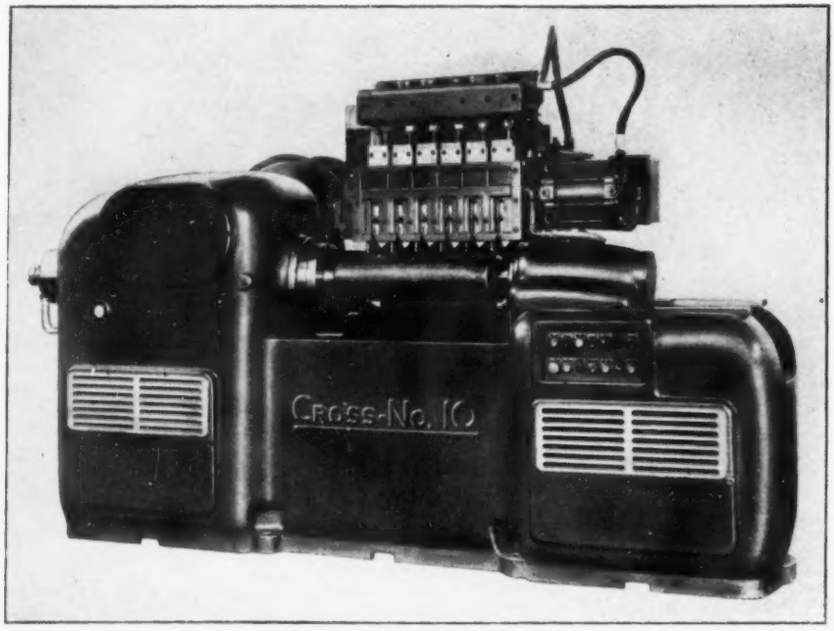
Write for Bulletin 601 . . . on the unusual features of The 3A Duomatic

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

ENGINE TOOL ROOM AUTOMATIC LATHES

Cross 100 Hp. Shell Lathe With Vertical Tool Slide Operates By Complete Electrical Pushbutton Control



Announcement of a shell lathe of 100 hp. capacity, having a vertical tool slide and with complete electric pushbutton control and full automatic operation, has been made by Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit, Mich. The overhead tool carriage provides tools with rigid support close to the cutting edge and allows chips to fall clear. All tools cut simultaneously while finishing the rough forgings to form in one operation. The cutting forces are directed down to the bed of the lathe. Tool thrust is transferred directly to hydraulic cylinders, and consequently the rollers "float" on the cams of the lathe with a balanced pressure. Three dials are provided for independent precision adjustment of the turning and facing tool feeds. Automatic lubrication is supplied to all moving parts.

The spindle of the lathe is carried on two straight roller bearings and a ball bearing to absorb radial loads, and two roller thrust bearings to absorb thrust loads exclusively. Spindle speeds range from 110 to 450 r.p.m. with pick-off gears.

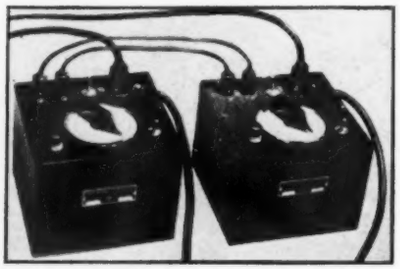
Hydraulic rapid traverse moves the tailstock on hardened and ground steel ways that are automatically lubricated. A live spindle is mounted directly in the tailstock with anti-friction bearings to eliminate quill construction and reduce overhang.

The machine occupies a floor space 135×85 in., and weighs 23,000 lb.

Photovolt Electronic Timer Made for Automatic Resetting

An electronic timer with immediate automatic resetting for timing periods from 1/20 sec. on has been announced by Photovolt Corp., 95 Madison Ave., New York, N. Y., which is designed for single actuation as well as for sequence timing and recycling in continuous operation. The dial divisions are arranged in approximately geometric progression so that turning the knob by a given angle results in the same percentage increase or decrease of the time interval over the whole length of the scale.

The timer opens or closes for the selected interval irrespective of how long the pushbutton is pressed, or how long the remote control impulse lasts. This is particularly important in timing short intervals inasmuch as the timing is correct although the operator



may hold the button down longer.

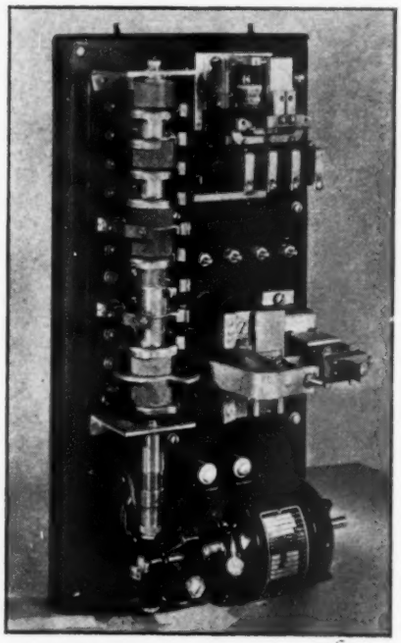
In order to change the loads from normally open to closed, or vice versa, it is only necessary to remove the bottom plate and to change the connection of terminals. The two loads are independent from each other.

This equipment is housed in a crackle finished steel casing 6×6×4½ in. and operates on 105 to 125 volts, 50 to 60 cycle a.c. and carries up to 1,200 watt load.

Westinghouse Type STA Relay Has Speed and Time Elements

Development of a new Type STA synchromatic relay for field application, compactly designed for panel mounting or dead front, metal inclosed, swing door type control structure, has been made by Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa. This relay consists of two elements, one that is speed responsive which is a current relay, and the other time responsive which is a rotary drum switch.

The synchromatic relay meets the following basic requirements for synchronous motor control; maximum non-synchronous speed attained before field application, minimum power required because synchronizing is never attempted before maximum speed is attained, synchronizes in minimum time consistent with maximum speed, positive synchronizing sequence, minimum line disturbance because of favorable rotor position, and automatic pull-out protection.



Ideal Machine Shop Etcher Has Fourteen Etching Heats

For permanently marking iron, steel and their alloys the Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill., has introduced the portable No. 18 machine shop etcher. "Hi-Lo" taps and a seven point switch give 14 etching heats between 115 to 1,300 watts. A red lamp on front of the etcher indicates when the power is on, and burns brighter as each higher heat is used. The depth of the mark can also be controlled by the speed of writing. Small tools to be etched are simply placed on the work plate, and for etching large, heavy parts and castings a ground clamp attached to

and now....

A LINE OF SPECIAL "DETROIT" HIGH PRECISION TAPPING MACHINES

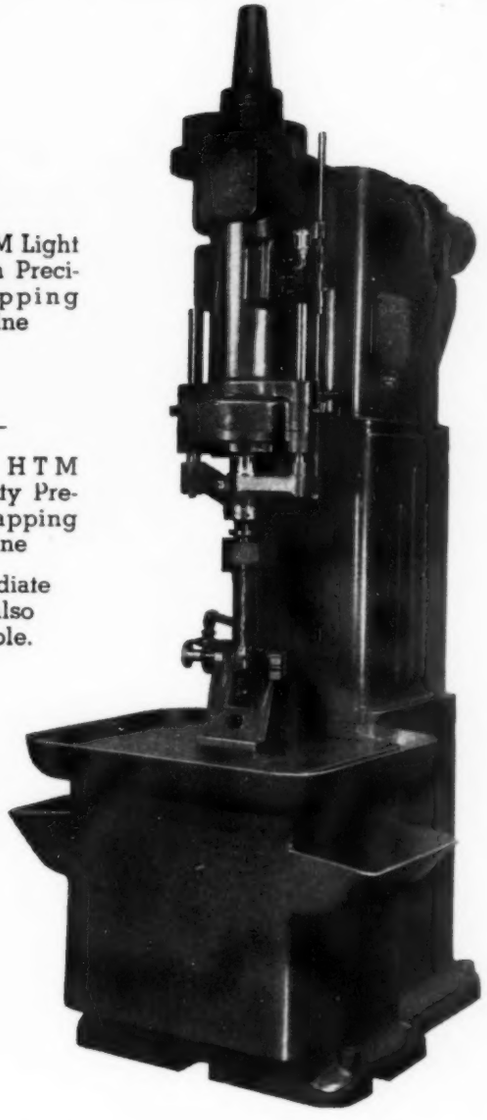
At Left—

Series LTM Light Duty High Precision Tapping Machine

At Right—

Series HTM Heavy Duty Precision Tapping Machine

Intermediate Sizes also available.

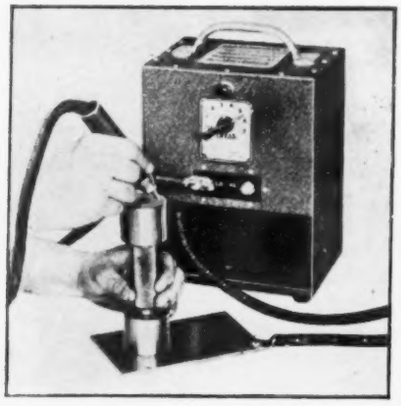


With such features as:

- Spindle nose guided during entire stroke
- Lead-Screw driven at bottom, eliminating inaccuracies due to "wind-up"
- Available with single or multiple tap heads
- Automatic reverse and return stroke
- No end play in tap spindle

For complete details write for Bulletin No. TM-43

DETROIT TOOL Company 8432 BUTLER DETROIT

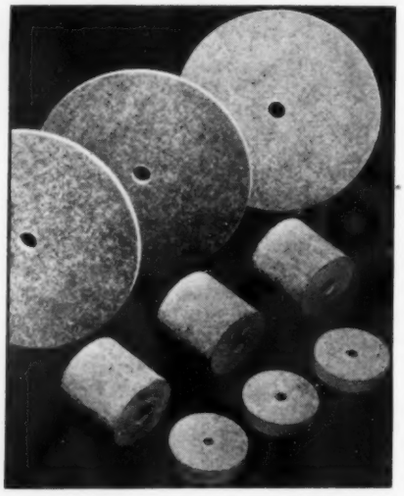


the work plate is provided. The etching tool has special heat radiating fins and an alloy tip point. The work plate is 4×7 in. with ground clamp attachment. The unit weighs 32 lb.

Carborundum Fabricated Wheels Made In Six Hardness Grades

MX wheels for finishing and polishing metal parts, made up of thin disks of cotton fibers impregnated or mixed with either the uniformly graded grains of Aloxite aluminum oxide or Carborundum silicon carbide, have been announced by the Carborundum Co., Niagara Falls, N. Y. These disks are bonded together or built up in the form of wheels of various thicknesses and diameters, and are used dry, without any coolant on any type of flexible shaft machine or electric hand grinder. Recommended operating speeds range from 6,000 to 8,000 surface feeds per minute.

Six grades of hardness are available in MX wheels, the harder grades Nos.

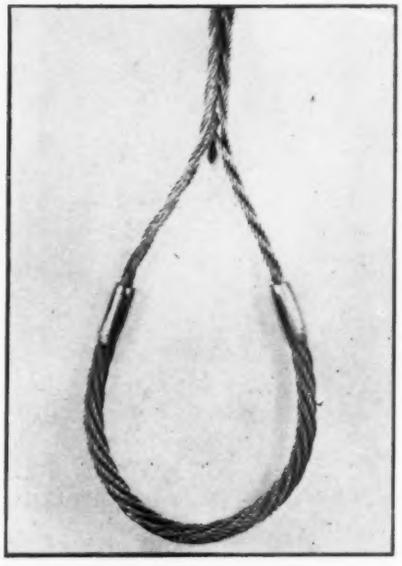


1, 2 and 3 being recommended on work having a more severe dressing action on the wheel; and the Nos. 4, 5 and 6 being recommended for the polishing of small plane surfaces or areas. These wheels are made in grits 50, 80, 120, 180 and 320.

Roebling Flatweave Rope Sling Is Non-Kinking, Non-Spiraling

Flatweave, a flexible wire rope sling, has been developed by John A. Roebling's Sons Co., Trenton, N. J. This is a light, non-kinking and non-spiraling sling for handling light and medium loads where the legs choke the load or the sling comes in direct contact with the load being lifted. The flat bearing surface allows an even pressure on each of the six ropes comprising the sling.

The body of the Flatweave sling consists of six separate ropes, two pairs being laid in opposite directions. These are united into a finished unit by two single tie ropes which alternately pass



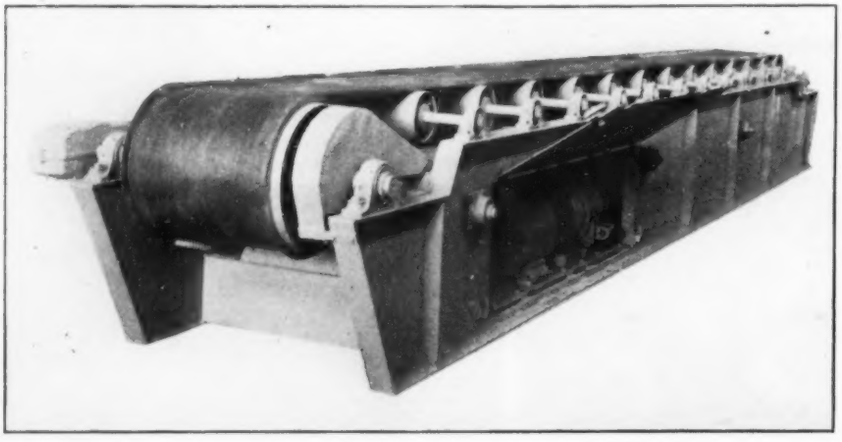
back and forth around one pair and then the other in a spiral figure eight. The compact steel sleeves are compressed over all rope ends, permanently securing them.

Stearns Picking Belt and Magnetic Pulley Separator Sorts Brass and Secondary Metals for Reclaiming

For the purpose of reclaiming brass and secondary metals from assorted junk and metallic refuse a combination picking belt and magnetic pulley separator unit has been developed by Stearns Magnetic Manufacturing Co., Milwaukee, Wis. This machine is 22 ft. long and 30 in. high and has an 18 in. endless, vanner edged belt which operates at 30 ft. per min. It is supported by idler rollers. The machine is equipped with anti-friction bearings.

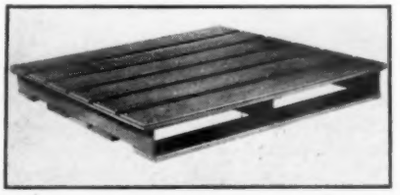
The arrangement of the picking belt ahead of the magnetic pulley provides means for sorting the material by hand, and an efficient manual and automatic operation in one machine. The drive of the magnetic pulley picking belt is by motor reducer and generator which is installed within the machine and equipped with covers that can be opened to give access to the drive.

Other sizes of the separator unit can be furnished to suit individual requirements.



Union Sturdy Wood Pallet Has Reinforced Steel Frame

A sturdy pallet which consists of wood slats top and bottom has been produced



by the Union Metal Manufacturing Co., Canton, Ohio. It is reinforced with steel at the ends and in the center. The wood slats are bolted to the frame and permit easy replacement of slats when necessary. The steel ends protect the pallet from damage by power fork trucks. Pallets are available in sizes to meet any usual materials handling requirements.

TODAY it may be an anti-tank gun, stripped for check-up... tomorrow, the still-warm "heart" of a fighter plane. So it goes. Fighting equipment gets tough treatment in modern warfare. So the need for frequent servicing and constant parts replacement is understandable.

But there is one vital part which maintenance men seldom have to touch, although they notice it often enough. The Torrington Needle Bearing, "changed over" to production-for-war, is again demonstrating its efficiency—and adaptability—in applications where its unique advantages mean more today than ever.

Its efficient system of lubrication, for example, which requires only occasional oiling, is reducing the need for maintenance attention or replacement. Its high capacity assures long bearing life, even in continuous operation under heavy loads.

Every feature of the Needle Bearing, significantly, is filling some important wartime need. Its small size is saving weight and critical materials; its remarkable ease of installation is cutting assembly time; its simplified design is eliminating extra parts and assembly steps, with low coefficient of friction assuring smooth performance.

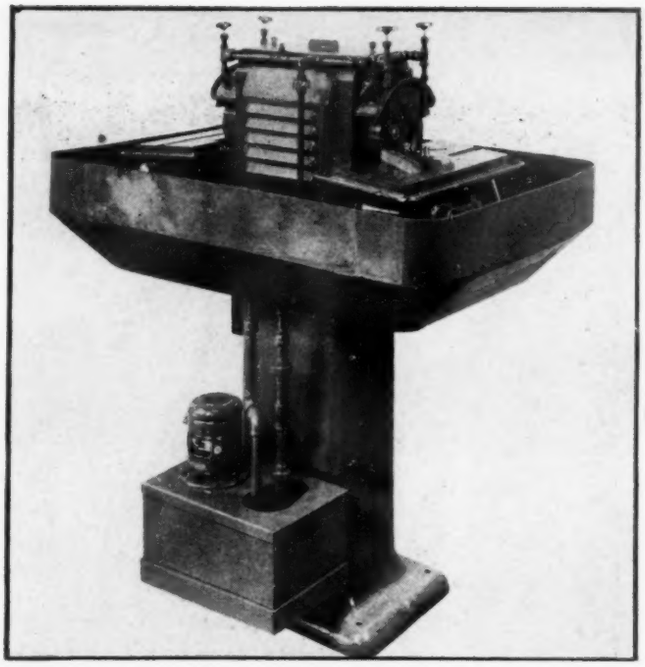
When Victory may hang on the amount of time it takes to service fighting equipment, it is not surprising that maintenance men these days are finding Torrington Needle Bearings in more and more of America's war materiel.

IF YOU HAVE A PROBLEM *which the Needle Bearing might solve, Torrington engineers can be of valuable assistance in adapting its advantages to your needs. You are welcome to their experience, as well as the information on Needle Bearing capacities and sizes in Catalog No. 105.*

THE TORRINGTON COMPANY
TORRINGTON, CONN., U. S. A. • *Established 1866*
Makers of Needle and Ball Bearings
New York · Boston · Philadelphia · Detroit
Cleveland · Seattle · Chicago · Los Angeles
San Francisco · Toronto · London, England

TORRINGTON NEEDLE BEARING

Every feature fills a wartime need



Hydraulic Portable Test Bench Checks the Circuit of Planes

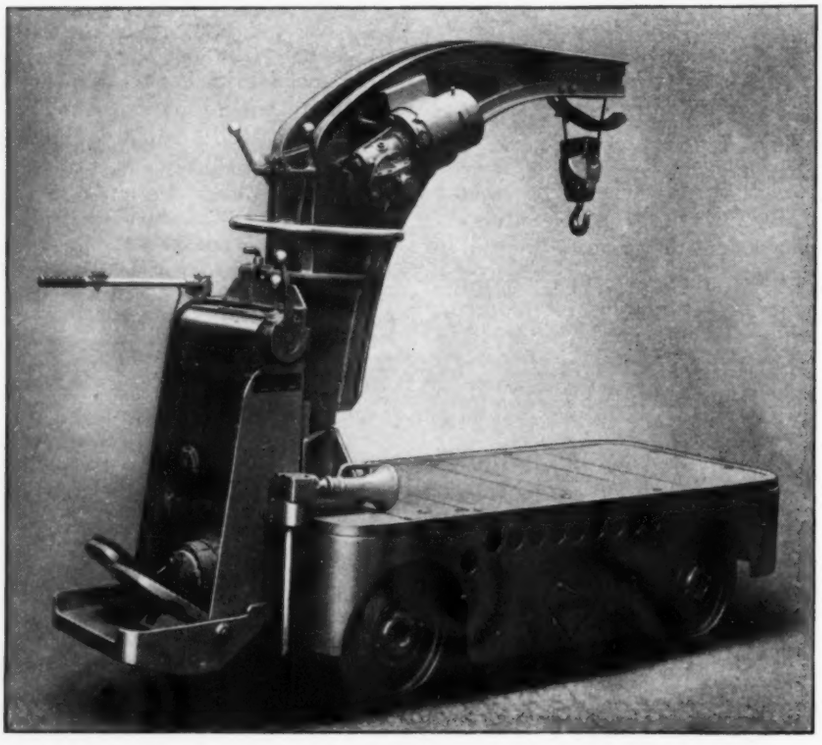
For pre-flight checking of the hydraulic circuit of planes before leaving the ground Hydraulic Machinery Inc., 10421 Grand River, Detroit, Mich., has brought out a portable hydraulic test bench. The equipment consists of a hydraulically operated air compressor. A variable displacement pump permits operation of the circuit at different speeds. It has an adjustable pressure range up to 1,000 lb. per sq.in. The unit can also be used to pump hydraulic fluid in and out of the plane.

All controls are accessible from the outside of the test bench. It is built with a hardwood top, mounted vise and built-in drawer and forms a combination portable work and test bench that can be wheeled to any desired place in the plant or on the field.

Willey's Double-End Grinder Has Special Motor Design

A Model 30 double-end grinder has been announced by Willey's Carbide Tool Co., 1342 West Vernor Highway, Detroit, Mich., which is designed to give maximum efficiency in the free hand grinding of tungsten carbide tipped tools as well as other types of toolbits.

The toolrest table is adjustable to all angles between 30 deg. toward the wheel and 30 deg. from the wheel. The table is also adjustable, with quick clamping features to compensate for wheel wear. The motor operates on 220 or 440 volts, 60 cycle, three phase, 3,450 r.p.m. The machine is furnished with a coolant pump and pan for wet grinding.



Elwell-Parker Power Truck Serves Triple-Duty Operation

Elwell-Parker Electric Co., Cleveland, Ohio, has introduced a power industrial transportation unit which may be used as a load carrier, a crane and a tractor separately or combines the operations of all three.

The load carrier has an unobstructed platform 84×40×25 in. with a rated capacity of 6,000 lb. As a crane it handles up to 2,000 lb. at 42 in. on the boom. When used as a tractor the unit first loads the trailers by means of its own crane and then hauls them.

The truck has a two-wheel drive and four-wheel steering. The frame is made of heavy section formed plates welded into a one-piece structural unit embodying the control dash. The boom consists of heavy formed channel members rigidly reinforced with tierods, lattice bars and gusset plates, and slews around a 3½ in. dia. alloy steel pillar. Other features of this truck are widely spread stabilizing compound coil springs on the drive and trail axle, heavy duty motors and equal length full floating drive shafts.

GIVING *Wings* TO PLANE PRODUCTION

TOOL LIFE INCREASED 33%... ACCURACY AND FINISH IMPROVED *with* SUNICUT

Excessive heat and short tool life hindered production in this manufacturing plant making vital parts for combat planes. Cutting oil needs were surveyed . . . Sunicut recommended. Now work runs cooler, tool life has increased 33%, finish is improved, closer accuracy obtained — all adding up to greater output per machine unit.

This report of a Sun Oil Engineer — one of those capable "Doctors of Industry" — is typical of the service they and Sunicut are rendering to our vast war industries.

Sunicut, a clear, transparent sulphurized cutting oil, takes the heat off tools and work . . . puts it on production. Sunicut's transparency permits ready micrometer readings . . . easy maintenance of close tolerances.

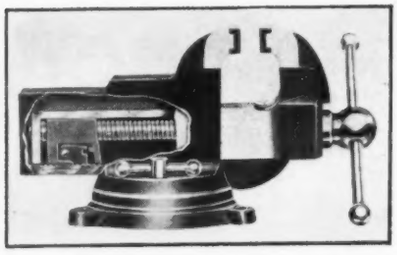
Sun Engineers stand ready . . . willing and able to help you in your own plant. Their services . . . and the products they offer . . . are yours to use in attaining victory production. For helpful case histories of how they have aided other leaders in the metal working field, write for your free copy of "Helping Industry Help America."

SUN OIL COMPANY, LTD. • Toronto

LET'S GO! U.S.A. KEEP 'EM FLYING!

SUNOCO

SUN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERICA



Pacific Quick-Action Vise Adjusted by Nut and Pawl

A quick-action vise developed by Pacific Vise Co., 6331 Hollywood Blvd., Los Angeles, Calif., features a nut and pawl which make it possible to open and shut the vise like a drawer and to lock it in any desired position with two turns of the handle. Two left turns disengage the pawl and permit opening and closing the jaws to fit the part to be gripped. Two right turns re-engage the pawl and firmly grip the part.

The castings of the vise are of semi-steel and all the working parts are of steel, fully inclosed, and interchangeable. The buttress threaded screw is

(*Continued on page* 1336)

National Broach Gear Shaver Handles Small Diameter Gears

Announcement of a small gear shaving machine, which will handle gears with diametral pitches of from 20 to 48 and finer, has been made by National Broach & Machine Co., 5600 St. Jean Ave., Detroit, Mich. It is known as Red Wing Model GCL-3 in. and is essentially a bench type machine, but is also furnished with a base containing a coolant system and electrical control panel. This is a vertical machine which gives the operator full visibility of the work gear at all times. The principle of rotary crossed-axes shaving is incorporated, using a gashed helical cutter which drives the work gear as it is being cut. The cutter rotates only in one direction.

In addition to the cutter spindle drive, the functional parts of the gear shaver consists of two slides both operated automatically. The vertical slide, on which is mounted the cutter head, is advanced and retracted to properly size and finish the product and to return to the loading position. The horizontal slide, carrying the work centers, reciprocates the work parallel with its axis across the face of the cutter. The operation of the two slides is so synchronized that in one cycle of the cutter head slide the work slide will make 4, 6 or 8 strokes as desired. A precision indicator on front of the vertical slide provides a constant check on size of the finished product.

The cutter head slide is actuated by a cam through a lever arm. One end of the lever contacts the cam surface while the other contacts the head slide. A counterbalance maintains a constant upward pressure on the slide, which in turn maintains constant pressure between the lever and cam. The cam is so shaped that at the end of a cycle the slide rises to throw just enough backlash between the work gear and cutter to permit easy unloading. Cam speed is varied by means of change gears. The machine stops automatically at the end of a cycle.

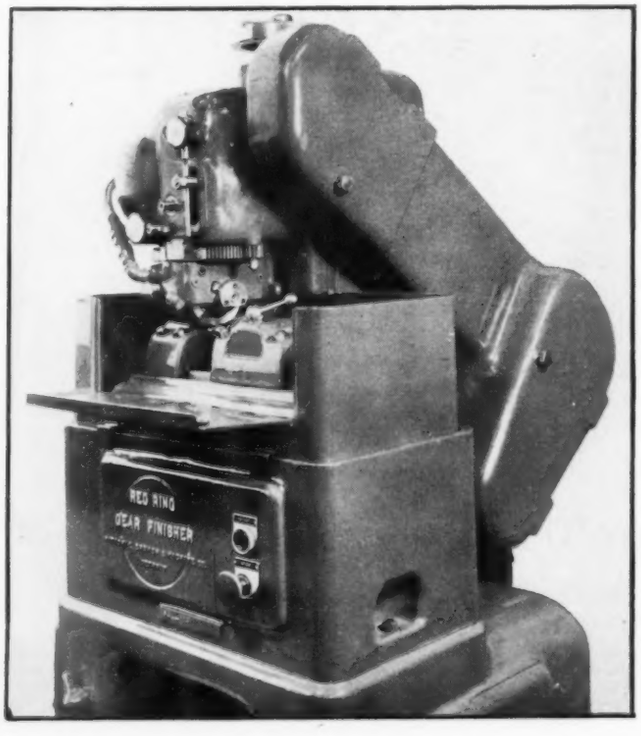
Three speeds of table reciprocation are available in addition to the three cutter spindle speeds and cycles of 4, 6 and 8 table strokes, giving an unlimited range of operation control.

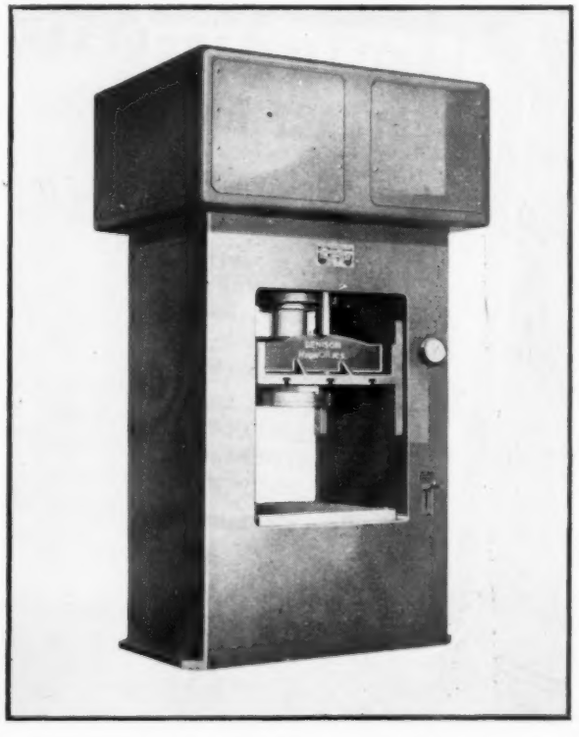
The weight of the bench machine only with motor is 900 lb.; and the model having base complete with pump, motor, chip basket and electrical control panel weighs 750 lb. net. Overall size of the bench model is 22¼ in. wide, 33⅜ in. high and 35½ in. deep; with base the measurements are 26¼ × 61⅞ × 35½ in.

Denison Hydraulic Press Serves Multi-Purpose Use

A multi-purpose, open side, 100 ton, HydroOILic press has been introduced by the Denison Engineering Co., 1152 Dublin Road, Columbus, Ohio, and is suitable for either small lot or production line work. The machine is adaptable for various special operations by means of the alteration of certain key parts. Oil is used for the transmission of power, and manual or electrical control is available. A separate tonnage adjustment control affords variable adjustment of the tonnage exerted by the press ram from approximately ten tons to full capacity. The maximum stroke of the ram is 18 in., and maximum throat opening is 18 in., vertical opening is 36 in. It has a working pressure up to 2,000 lb. per sq.in.

The frame of the press is welded steel construction while the cylinder assembly consists of cast steel. The ram is made of ground and polished steel fitted with a guide head operating in the ram guides on the inner sides of the press. The unit is available with either a guided platen or a threaded ram. The height of the machine is 11½ ft. and the width at the base is 64 in. with depth of 40 in.





What the clock manufacturers are making would alarm Hitler

Alarms and other clocks may not be as plentiful as they once were . . . although it is believed there will be enough for every war worker. But fewer clocks, and fewer everything for civilians, is good news for Americans because it is the worst of news for Hitler.

In converting production facilities from clocks to war essentials, manufacturers were able to overcome new problems easily and quickly in cooperation with the Revere Technical Advisory staff. For in all problems of copper and its alloys, Revere supplies a service, in addition to sound metals, that helps untie the knots of processing and fabrication.

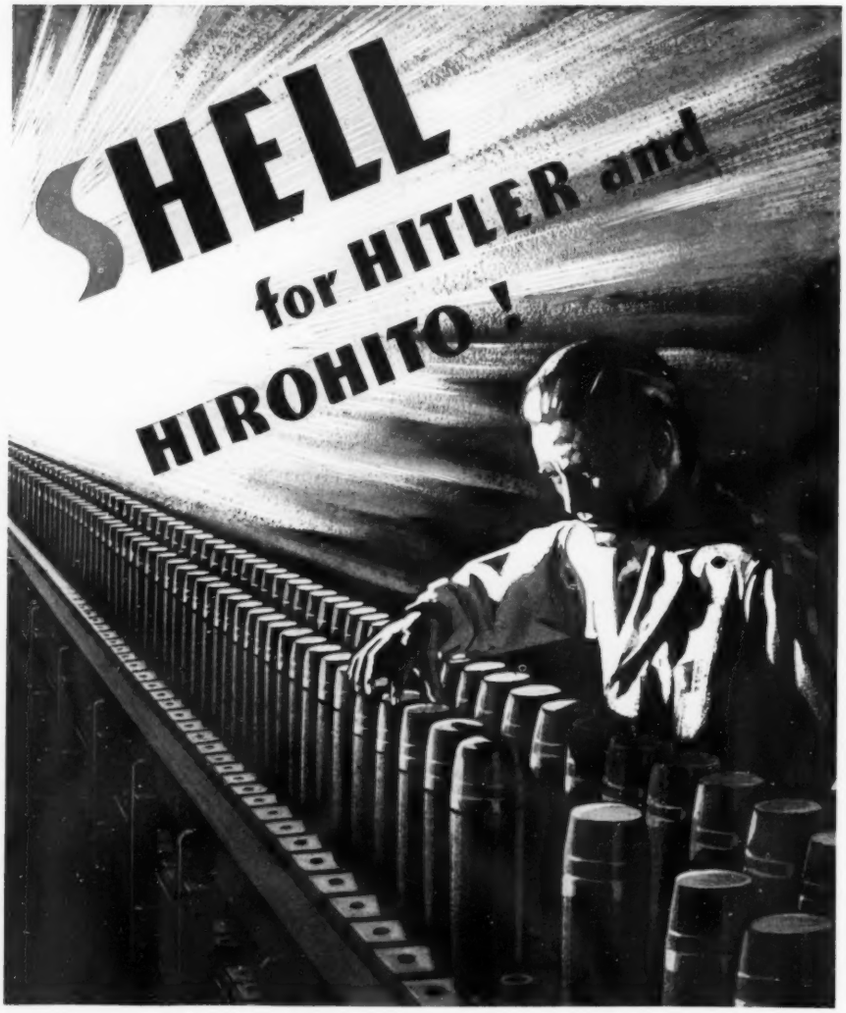
Every ounce of copper our country can produce goes directly into war essentials. Fortunately, Revere is well equipped, with modern plants, improved machines and advanced techniques, to assume a heavy responsibility in meeting critical needs. And Revere research is continually uncovering new knowledge about copper to help make our arms more swift and sure.

The Revere Technical Advisory Service functions in (1) developing new and better Revere materials to meet active or anticipated demands; (2) supplying specific and detailed knowledge of the properties of engineering and construction materials; (3) continuously observing developments of science and engineering for their utilization in production methods and equipment; (4) helping industrial executives make use of data thus developed. This service is available to you, free.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK



Shell pouring off the production lines in scores of America's munitions plants gives the right answer to Axis "global grabbing."

And Standard Conveyors help to keep shell moving — swiftly and smoothly — through successive steps in production and on their way to the battle fronts.

Designed specifically for the handling of shell, these conveyors were developed by Standard engineers in response to an immediate need of American munitions makers. Just as they have always designed conveyors for new and better ways of handling peacetime products, Standard engineers met the emergency without hesitation, drawing upon their long experience — their thorough familiarity with industrial handling needs.

If you are producing war material or other products considered necessary to the war effort, find out what Standard Conveyors can do to step up production in your plant. Write for full information and copy of "Conveyors by Standard"—a valuable handbook on conveying methods.

Write for Bulletin A.M. 11

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minn.

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Gravity and Power
CONVEYORS

★ ENGINEERED FOR FASTER PRODUCTION ★

entirely inclosed in a single casting and supported at three points to maintain correct alignment under all conditions and to give added gripping power without strain. A swivel base locking bar with two screws provides a positive lock in any position. The vises are available in 4½, 6 and 7 in. sizes, in swivel base or solid base types.

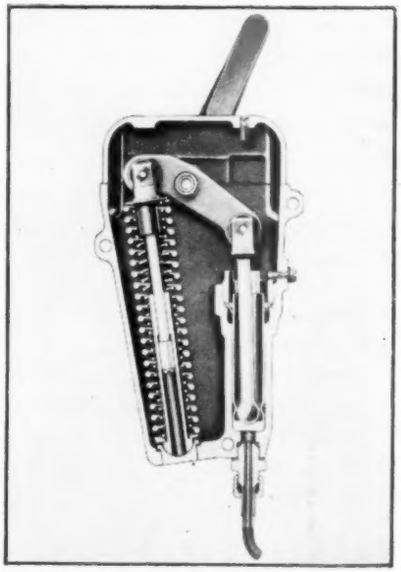
Industrial Plating Process Will Build Up Worn Areas

A micro- and spot-plating process has been developed by Industrial Chromium Corp., Holyoke, Mass., for building up worn or deficient areas on tools, dies, jigs, instruments and machine parts, or for building into new parts wear and corrosion resistant surfaces. The micro-plating, with chromium or any other metal, is applicable to internal as well as external surfaces regardless of shape or size, and in thicknesses from 0.00001 in. upward. The plating is applied only where needed and thus saves metal and eliminates costly machining.

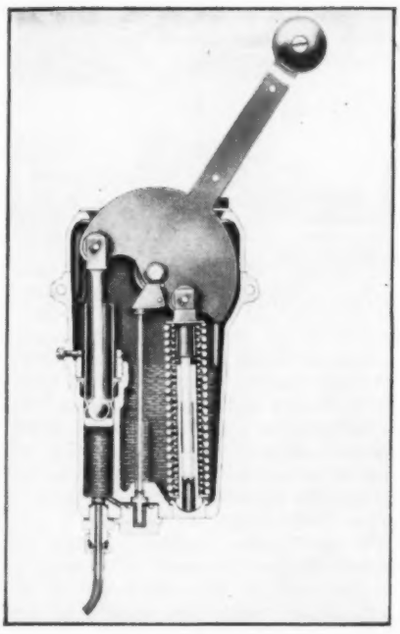
Sperry Exactor Control Unit Has Varied Industrial Uses

Announcement of an exactor hydraulic control has been made by Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J., suitable for application in the aircraft, marine, railroad and industrial fields. The two units of the control are the transmitter, fitted with a handle, and the receiver which delivers through its lever whatever motion is imparted to the transmitter handle. Cylinders in these units are fitted with trunk type pistons and special packing glands to prevent fluid leakage.

A downward movement of the trans-



The receiver unit transmits whatever motion is imparted to the transmitter



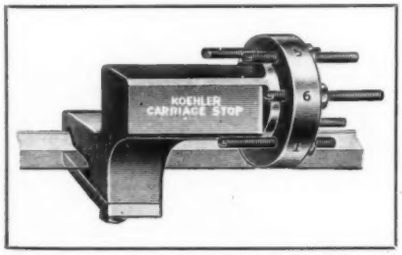
Movement of the lever operates the transmitter piston

mitter piston forces a definite quantity of fluid to pass to the receiver, thus moving the receiver piston upward and causing the lever to move through an equal arc. Equal and constant forces on each piston are provided by an internal arrangement of springs and rocker arms. Any deficiency of fluid to be replaced or any excess to be exhausted are taken care of by opening a valve venting the system into the oil reservoir which is accomplished by forcing the transmitter handle a short distance beyond its starting position and operating a tripper lever.

On suction stroke the control will deliver 100 in. lb. of torque, on pressure stroke two or three times this amount. The receiver lever can be set at 10 deg. intervals on its shaft.

Koehler Six- and Eight- Tool Turret Heads Fit Engine Lathe

Six- and eight-tool turret heads have been announced by Koehler Instrument Co., along with a six- or eight-position carriage stop accessory to the turret heads, and boring toolholder. The six-tool head can be used on the ordinary engine lathe of from 9 to 12



An adjustable stop for each tool is provided in the carriage stop

Steel-Service Plants Vital to War Effort

Wartime manufacturers by the thousands are relying on their nearby Steel-Service warehouses to supply small quantities of urgently needed steels. Emergency repairs; bottle-necks in mill deliveries; threatened production line shortages; steel for experimental and model machinery —these problems are all a part of the day's work for a Steel-Service Plant. These firms, among whom Joseph T. Ryerson & Son, Inc., in particular, has shown exceptional ingenuity in solving wartime problems.

(See Advertisement)

Answering inquiries and handling customer problems at Ryerson.

True: Steel is Short-
But Ryerson Often Solves the Problem

IN America's vast production effort, there is some man in every company who is responsible for *getting* steel—a man who must get things *done.* In some plants he's called an "expeditor". But whether he is purchasing agent, expeditor, or plant manager, he *must get results.*

Ryerson Steel-Service is built to order for his needs! When steel problems become a stone wall, Ryerson usually can come thru with some practical solution. A suitable alternate for steel that's vitally needed, but isn't in stock; a suggestion for heat-treating, machining, welding, or some other way to adapt the steel at hand; rush handling and delivery that will lay the steel down where it's needed, *when* it's needed!

While this is all in the day's work for Ryerson Steel-Service men—you must keep in mind that we are entirely out of many kinds and sizes and that all must be sold in strict accordance with the WPB program.

This help in getting things done is available to your organization. Ryerson Steel-Service men are easy to reach; they'll give you prompt consideration.

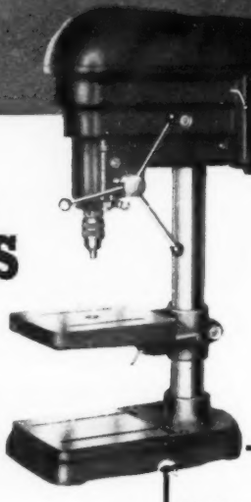
Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cincinnati, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON STEEL-SERVICE

Green Help? ...SURE!

BUT PRODUCING O. K.
THE FIRST WEEK!

Boice-Crane
DRILL PRESSES



MORE PRODUCTION
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UNSKILLED WORKERS
AND WOMEN

Save Space . . . Tool up
New Jobs Quicker . . . . .

Make inexperienced and female help real producers in a hurry. Hundreds of plants at work on U. S. armament are accomplishing that with these compact, stripped-for-action Boice-Crane Drill Presses. More easily adaptable to special needs and far more flexible in tooling up production. Big production increases are reported on practically every installation. They cost less too, and you can get them RIGHT NOW!

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DRILL PRESSES

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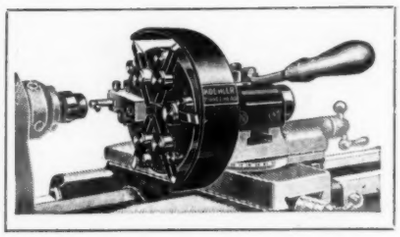
WOODWORKING MACHINES

Available Now!

BOICE-CRANE COMPANY

935 W. Central Ave. **Toledo, O.**



The six-tool turret head can be used on an ordinary engine lathe

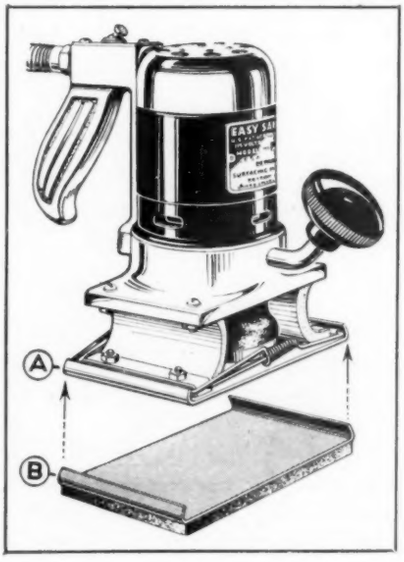
in. swing, where the distance between the top of the compound rest and center line of lathe is from 1 to 1 7/16 in.; while the eight-tool turret head will fit lathes of a 12-in. swing or more, where the distance between the top of the compound rest and center line of lathe is 1½ in. or over.

Standard 5/16 in. toolbits are used for the six-tool head and ⅜ in. toolbits are suitable for the eight-tool head. Each is independently adjustable for height by adjusting screws, allowing for sharpening and wear of the tools.

The carriage stop provides an adjustable stop for each tool and is clamped on the V of the lathe near the headstock and controls the cutting and boring operations of the turret head.

Easy Reciprocating Sander Finishes Metal, Wood, Plastic

Sanding, rubbing, and wet or dry polishing can be handled with the Model XLD Easy reciprocating electric sanding machine announced by Detroit Surfacing Machine Co., 7433 West Davison, Detroit, Mich. This is a portable machine with a detachable bottom plate which plugs into any electric light socket. Curved or flat as well as irregular surfaces of metal, wood, plastic and composition surfaces can be finished with the sander. The reciprocating action duplicates the back and forth motion of hand work.



An accessible thumb switch operates the unit and a speed of 3,000 strokes per min. is attained in operation. Power is supplied with a heavy-duty electric motor in either 115 or 230 volt models. The sander weighs approximately 7½ lb.

Clark Leather V-Belting Has Ball Bearing Fastener

Continuous length V leather belting with ball bearing fastener has been introduced by Victor R. Clark Belting Co., 605 West Washington Blvd., Chicago, Ill. A heavy middle ply does the pulling while the outside plies of the belting do the gripping. Longitudinal strength is concentrated in the leather section which straddles the pitch line. This section of the belt is built of tough, stretch resisting leather. The top and bottom plies are of firm, wear resisting but elastic leather which spreads and grips the pulley sides as the belt arcs over the pulleys. The belting is waterproof, long-lifed and oil resisting.

The fastener holds the belt ends snugly together and may be attached with nuts either to the top or bottom of the belt.

NEW MATERIALS

D. & R. Bar-Rust Metal Paint Made In Primer and Finish Coat

Bar-Rust metal protective paint has been developed by Devoe & Raynolds Co., Inc., 44 St. and First Ave., New York, N. Y., for the protection of outside and inside surfaces of industrial plants having considerable exposed metal. The rust inhibitive primers provide a tough and elastic film which will expand and contract at the same ratio as the metal over which applied. The finish coat materials of different colors to go over the primers withstand exposure to rain, sun, ultra-violet and infra-red rays, industrial acid fumes and gas.

Both primers and finish coat materials have been formulated to flow out in a uniform film thickness and have the ability to cling to the surface around rivets, bolts, and sharp edges.

Felt Products Develops Fel-Pro To Replace Rubber in Stripping

Fel-Pro Thiokol strip material has been produced by Felt Products Manufacturing Co., 1530 Carroll Ave., Chicago, Ill., as a substitute for critical materials formerly utilized in gaskets and strips. This material has been developed by application of special methods of Thiokol to a specially processed felt base, resulting in a spongy rubber cushioning effect. It is weather resistant. The strips have already been produced in lengths well over 6 ft.

Woody Spencer says...
"YOUR HIGH SPEED TOOL STEEL SCRAP IS BADLY NEEDED . . . MAKE THIS YOUR CONSERVATION PROGRAM . . . "
1. DO NOT THROW AWAY ANY SCRAP.
2. SEGREGATE HIGH SPEED TOOL STEEL SCRAP FROM REGULAR SCRAP METAL
3. WHEN A REASONABLE AMOUNT HAS BEEN SAVED, SEE THAT IT GETS BACK TO THE STEEL MILLS THROUGH THE PROPER CHANNELS.
WOOD & SPENCER CLEVELAND
Do not return to Wood & Spencer
You can cut down waste on taps by carefully selecting the right tap for every job. We'll be glad to help you . . . write on your company letterhead for our latest catalog.
"THE RIGHT TAP AT THE RIGHT TIME"
The Wood & Spencer Company
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Laminum shims place quick *precision* in the hands of every assembly and maintenance man. (.003 or .002 in. brass laminations bonded together and easily peeled.) Cut to your specifications.

Stock shim materials obtainable from your mill supply distributors. (Write us for sample and illustrated application chart.)

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THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

TRADE PUBLICATIONS

AIR CLEANER—Bulletin No. B-3083 describing the use of Precipitron in war industry production is announced by the Westinghouse Electric & Mfg. Co., Dept. 7-N-20, E. Pittsburgh, Pa.

ALLOY STEEL A loose-leaf insert sheet No. 138, section 10, "Revised National Emergency Steel Composition," has been issued by American Iron and Steel Institute, 350 Fifth Ave., New York, N. Y.

CENTRIFUGAL PUMPS Bulletin No. B6059-H, a compact compilation of facts on a complete line of pumps, has been released by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CHEMICALS The National Fire Protection Assn., 60 Batterymarch St., Boston, Mass., has released its sixth edition, "A Table of Common Hazardous Chemicals," prepared in cooperation with the American Chemical Society. Information is given on the best methods of extinguishing fires in certain chemicals and for combating possible incendiary bombs. 20 cents.

CONVEYOR BELTS Step-by-step procedures of making repairs are described and illustrated in "Rubber Conservation for Users of Industrial Rubber Belting," issued by B. F. Goodrich Co., Akron, Ohio.

CYLINDRICAL LAPPING "Increasing of 'Wear Life' by Cylindrical Lapping" is the title of a booklet reprinted from Grits & Grinds by the Norton Co., Worcester, Mass.

DIE DATA Rules for finding die cushion size or ring holding pressure required on the cushion, when dimensions of the first drawn shells are available, are set forth in a 8½×11 in. insert sheet published by Dayton Rogers Mfg. Co., 2835 Twelfth Ave., Minneapolis, Minn.

DIES A profusely illustrated 36-page die and tool catalog has been issued by the Cyril Bath Co., Cleveland, Ohio.

DRILL GRINDING The proper methods of grinding rifle drills are described and illustrated in a guide book published by W. F. & John Barnes Co., Rockford, Ill.

ELECTRIC ARC ETCHER A catalog of munitions engravers, electric arc etchers and accessories has been published by the George Gorton Machine Co., Racine, Wis.

ELECTRICAL CONNECTORS A condensed catalog supplement covering the most popular types of electrical connectors has been issued by the Cannon Electric Development Co., Los Angeles, Calif.

ELECTRIC MOTORS Allis-Chalmers Mfg. Co., Milwaukee, Wis., has released a bulletin, No. B6052-C, designed to give all the facts necessary for quickly choosing correct motors for wartime applications.

ELECTRIC SWITCHES A combination bulletin and price sheet, describing the Allen-Bradley line of Bulletin 600 manual starting switches for motors rated up to 1 hp., 110–220 a.c. and ¾ hp., 115–230 d.c., has been published by Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis.

ELECTRICAL WIRING A new catalog and wiring guide, No. 16, 1942, published by the Wiremold Co., Hartford, Conn., places emphasis upon wartime industrial applications and includes new items.

EMPLOYEE ORIENTATION An illustrated manual for their new employees has been issued by Manning, Maxwell & Moore, Inc., Bridgeport, Conn., and copies are being offered to other companies desiring to produce a like publication.

FORGED STEEL FITTINGS The different kinds of forged steel fittings are described in the profusely illustrated bulletin No. A-3, issued by Watson-Stillman Co., Roselle, N. J. Specifications, prices and formulae for carbon, carbon-molybdenum, chromium-molybdenum, stainless and forged steels are given.

FURNACES Electric furnaces for industrial and laboratory uses are described in a bulletin issued by the Cooley Electric Mfg. Corp., Indianapolis, Ind.

FURNACES Bulletin No. HD-1042, "The Hevi Duty Gas Cracking Unit," has been published by Hevi Duty Electric Co., Milwaukee, Wis.

GRINDER DRESSING An instruction booklet offered by the Koebel Diamond Tool Co., Detroit, Mich., explains how a wheel should be dressed, the necessity for care in handling diamond tools, and other pertinent data. It is especially designed to aid in instructing women trainees.

GRINDING MACHINES Heavy ordnance grinders, designed for peacetime alteration to the finishing of crowned rolls, are described in a folder prepared by the Norton Co., Worcester, Mass.

HEALTH AND SAFETY A manual devoted exclusively to the health and safety of women in industry has been published by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

HEAT CONTROL A bulletin on compensated control for zone temperature

control has been issued by the Barber-Colman Co., Rockford, Ill. It contains detailed information on uses of compensation control in new and existing buildings, and its adaptation to various types of systems and types of firing.

HEATER A catalog describing the new cast iron "Grid" unit heater manufactured by D. J. Murray Mfg. Co., Wausau, Wis., to take the place of the "Grid" unit made with aluminum heating sections, is available. It contains capacity tables on the six models, a typical hook-up and dimension diagrams and other pertinent information.

INSTRUMENTS Catalog No. 95-A, just issued by The Foxboro Co., Foxboro, Mass., describes its full line of instruments for the measurement and control of industrial process conditions.

LATHES Bulletin No. 1004 describing the South Bend turret lathes Nos. 1003-C and 1004-C, has been recently issued by the manufacturer, the South Bend Lathe Works, South Bend, Ind.

MACHINE TOOL OPERATION To aid in the instruction of trainees, Continental Machines, Inc., 1301 Washington Ave., S., Minneapolis, Minn., has published a group of maintenance manuals. They are designed to ease the load of training new men and at the same time keep machine tools operating effectively.

MACHINE TOOLS Bulletins No. DTL-427 and No. P-600, issued by the Inter-state Machinery Co., 1431 Pershing Rd., Chicago, Ill., describes Diehl turret lathe No. 2, and a line of milling machines, radial drills, drill presses, grinders, planers, slotters, shapers and other machine tools.

PLANERS Ohio Machine Tool Co., Kenton, Ohio, has published Bulletin No. 500, describing their line of standard and heavy duty double housing planers, and giving specifications.

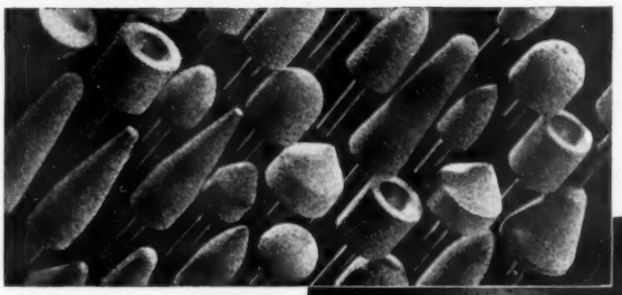
PLASTICS "The Koroseal Hand Book of Technical Information", issued by the B. F. Goodrich Co., Akron, Ohio, describes the manufacture of Koroseal and its related products, the physical, chemical, electrical and processing characteristics of Koroseal compounds, as well as a description of the tests used in determining its properties.

PLASTICS Submission of parts problems is invited in a folder issued by Creative Plastics Corp., Brooklyn, N. Y. Through illustrations and captions, the folder points out the value of plastics as substitutes for unavailable materials.

PRECISION TOOLS Catalog No. 42 of the Acme Tool Co., 200 Church St., New York, N. Y., features precision production tools.

PRESS BRAKES A 64 page, heavily illustrated catalog on press brakes has just been completed by the Cincinnati

POLISH 'EM OFF WITH



They're TOUGH and DO their STUFF!

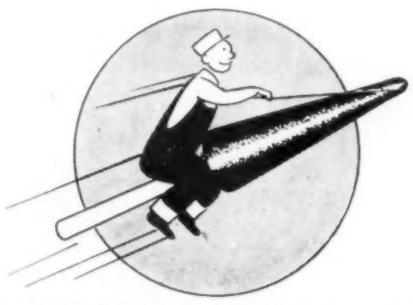
Commandos of the grinding wheel industry—the first small wheels mounted on steel shanks and leading the way today with smoother, more rapid grinding, polishing and finishing of difficult jobs.

Chicago Mounted Wheels—the result of 45 years of KNOW HOW—come in a wide range of styles on different size shanks, for use with any portable or flexible shaft grinder. Several special-formula abrasives give 150% to 300% longer service. More than 200 shapes, all mounted and rarin' to go.

HI-POWER GRINDER

A real production tool—a 3-pounder with enough power to drive a 2½" diameter wheel. 17,000 r.p.m. In case with accessories, $38.50.

LATEST CATALOG—Packed full of comprehensive information and pictures. You'll be interested. Send for copy.



TEST WHEEL FREE

If you have a grinding problem, send for a Survey blank, which you'll find easy to fill out. Upon its return, our abrasive engineers will analyze it and send you without charge the trial wheel they recommend for your particular job.

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☐ Send Hi-Power Catalog

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Size .....

Name .....

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National Emergency Alternate Steels

Designation	Chemical Composition (b)				
	C	Mn	Mo	Ni	Cr
NE 8024	0.22-0.28	1.00-1.30	0.10-0.20	....	....
NE 8124	0.22-0.28	1.30-1.60	0.25-0.35	....	....
NE 8233	0.30-0.36	1.30-1.60	0.10-0.20	....	....
NE 8245	0.42-0.49	1.30-1.60	0.10-0.20	....	....
NE 8339	0.35-0.42	1.30-1.60	0.20-0.30	....	....
NE 8442	0.38-0.45	1.30-1.60	0.30-0.40	....	....
NE 8447	0.43-0.50	1.30-1.60	0.30-0.40	....	....
NE 85	0.43-0.50	1.30-1.60	0.40-0.60	0.40-0.60	0.40-0.60
NE 8			0.15-0.25	0.40-0.60	0.40-0.60
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Will the Machinability of NE Steels prove to be a Tough Problem?

THE answer will be "Yes" or "No"—depending upon the skill used in handling the change-over.

Changes may be required in tools and tooling; changes in speeds and feeds, *and in cutting fluids.* When this last factor is considered

Stuart Oil Engineering Service

is equipped and ready to help you apply the *Right Cutting Fluid* to "cranky" steels.

Stuart's Thred Kut
HEAVY DUTY CUTTING OIL
Recommended by America's leading machine tool builders

Stuart's SOLVOL
LIQUID CUTTING COMPOUND
For carbide tools and where an "aquamix" solution is recommended

Stuart's CODOL
LIQUID GRINDING COMPOUND
Meets every test for the Ideal Modern Grinding Compound

Stuart's "SUPER-KOOL"
AMERICA'S FIRST TRANSPARENT SULPHURIZED CUTTING AND DRAWING OIL

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

Shaper Co., Cincinnati, Ohio. It is largely devoted to pictures showing press brake applications, bending and punching load charts, features for special work, and pages of dies and their uses.

SOLVENT Two new illustrated leaflets describing Perm-A-Clor degreasing solvents, are now being issued by the Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich.

STEEL Section 18 of the Steel Products Manual covering steel tubular products has been issued by American Iron and Steel Institute, 350 Fifth Avenue, New York, N. Y.

STEEL A complete combined list, No. TDC-119, of standard steels of the American Iron and Steel Institute and the Society of Automotive Engineers, Inc., has been issued by the Babcock & Wilcox Tube Co., Beaver Falls, Pa.

STEEL FINISHING The Du-Lite Chemical Corp., 34 River Rd., Middletown, Conn., has published a booklet covering the development, operation, advantages and service rendered of the Du-Lite Process of black oxide finishes for all steel parts and products.

STEEL TUBING Literature of the Summerill Tubing Co., Bridgeport, Pa., illustrates their standard types of tubing and special uses that have been made of them.

SWIVELS Engineering Bulletin No. 424, Trabon Engineering Corp., 1814 East 40 St., Cleveland, Ohio, describes their new line of straight and angle swivels for making oil, grease, air and other line connections between stationary, and moving or oscillating surfaces.

TOOL STEEL A chart offered by the Carpenter Steel Co., Reading, Pa., presents illustrations and data for identifying tool steel by spark tests. These tests have the dual advantages of aiding in segregating tool steel scrap and in classifying tool steels that have lost identity in stock.

VALVES "How to Repair Valves" is the title of bulletin No. 5 on piping pointers, issued by Crane Co., Chicago, Ill. It explains and illustrates the various steps to take in repairing leaky gate and globe valves, as well as hints on how to reclaim discarded valves.

V-BELT DRIVES Simplifying the problem of selecting correct V-belt drives for wartime applications is the primary purpose of Bulletin No. B6051-C, issued by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Included are simplified charts and tables.

WELDERS Bulletin No. 801AM, covering a new line of standardized seam welders, has been released by Progressive Welder Co., 3050 E. Outer Drive,

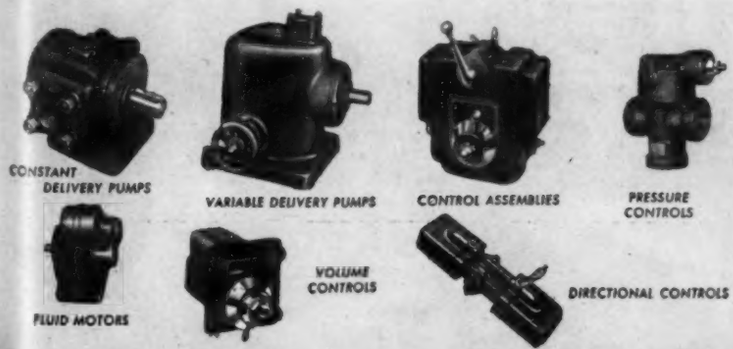
HIGHER PRODUCTION RATES... *from machines having* VICKERS HYDROMOTIVE CONTROLS

Higher production rates . . . greater operating reliability . . . less maintenance . . . simpler operation . . . have been the experience of many manufacturers using a wide variety of machines equipped with Vickers Hydromotive Controls.

Completely automatic operating cycles are easily obtainable with Vickers Hydraulic Equipment . . . machining operations are infinitely and instantly (during cycle) variable by simply turning a dial. The machine with Vickers Hydromotive Controls has positive and automatic overload protection . . . exact load limitations can be predetermined and accurately maintained. Operation controls are so interlocked that neither the work nor the machine can be damaged by the inexperienced or careless operator. Spoiled work or damaged machines is production lost.

You will find it advantageous to discuss possible improvement of machine controls with Vickers Application Engineers.

VICKERS *Incorporated* • 1410 OAKMAN BLVD. • DETROIT, MICHIGAN



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More than 5000 Standardized
VICKERS UNITS
for every Hydraulic Power and Control Function

ROEBLING Wires
ROUND . . . FLAT . . . SHAPED
A FEW WIRES TYPICAL OF ROEBLING'S BROAD SPECIALTY PRODUCTION
WAR ORDERS SPEEDED BY THE WIRE PRODUCTION BOARD
FLAT WIRE TO SPECIFICATIONS
SHAPED WIRES
STEEL, BRASS AND COPPER AIRCRAFT ENGINE SAFETY WIRE

The Roebling Board of Wire Production Strategists can save you hours of precious time by delivering wire that is *all ready* to be wrapped into your victory products. For example, a "tremendous trifle" such as the Airplane Engine Safety Wire that prevents vital fastenings from shaking loose under thousand horsepower vibration.

Making these wires is a specialty. Some call for extremely close control of steel analysis . . . others require brass or copper to exacting "specs", and they *all* require extreme ductility.

Do these specialty wires suggest a short cut to beating your quota? Roebling round, flat and shaped wires have been the prevention of hundreds of "too little, too late" problems where wire is the critical factor. They may be the answer to yours.

JR ROEBLING

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY - Branches and Warehouses in Principal Cities

Detroit, Mich. Diagrams, specifications and illustrations are given for the various weights and styles of seam welders.

WELDING Preheat temperatures and other pertinent data for welding 79 principal ferrous and non-ferrous alloys most commonly used in industry, is being offered by Tempil Corp., 132 West 22 St., New York, N. Y.

WELDING Booklet No. B-3090, "A-C Welders for Use With the Unionmelt Process," is available from department 7-N-20, Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. Several applications are listed and described, and photographs illustrate the various parts of the unit and some applications.

WELDING The use of oxyacetylene flame and electric arc processes in aviation production is reviewed in a 16-page booklet, "Airco in Aviation," offered by the advertising Dept., Air Reduction, 60 East 42 Street, New York, N. Y.

WELDING Ampco Metal, Inc., Milwaukee, Wis., has released a six-page bulletin describing Ampco-Trode 10, an all-purpose, coated bronze electrode.

WELDING The B. F. McDonald Company, 1248 S. Hope St., Los Angeles, Calif., has issued a brochure describing their line of welding glasses, hoods and face shields.

NEW BOOKS

MACHINE SPEEDS AND FEEDS—*Compiled by Hayward-Tyler & Company, Ltd. 130 pages. Published by the Chemical Publishing Company, 234 King Street, Brooklyn, N. Y.* $2.25.

Many machine tool operators, especially apprentices and those completing short machine shop courses, often need guidance in selecting the proper speed and feed for machining metals. This book has been prepared specifically for that purpose. It is a collection of tables and data relating to the machining operations on cast iron, steels, and non-ferrous metals, using high-speed steel tools. The tables group information required for each type of machine in the easiest form for quick reference.

For drilling and tapping operations tool speeds and revolutions per minute are given for tap sizes from ⅛ to 5 in., together with the proper tapping drill size. For straight holes in the various metals, the data include spindle speeds for drills from ¼ in. up. For reamed holes, the tables list the corresponding drill size and reamer speeds.

For turning and boring operations, the authors have included sketches showing recommended tool angles. Rough and finish turning speeds in revolutions per minute are listed for work of ½ to 15 in. diameter for all

types of ferrous and non-ferrous metals.

Data on milling operations are also included. Roughing and finishing speeds in revolutions per minute are listed for cutters ranging from 2 to 14 in. diameter.

The speeds and feeds listed in this book are not the highest possible figures; however, they are average values which can be used with reliability to start a job. The values can be increased, depending upon variable operating conditions and production demands.

Hardened Crane Rails

The flame-hardening process has been applied successfully to the hardening of crane rails in a plant manufacturing heavy machinery. These 180-lb. rails have a 4-in. wide ball and are 28 ft. long. A scleroscope hardness of 60 was obtained, using a No. 4 Airco Radiagraph, a Style 4380 torch, and a 4-in. wide Style 56 tip. In addition to the quenching water from the tip, an additional spray of water was used directly behind the flame in order to get a more rapid quench. A stream of water also was played on the rail a short distance in front of the flame to prevent too much heat building up in the rail, a condition which would have reduced the hardness, and given less uniformity. The distortion over the entire rail section was about ½ in., but this presented no difficulty since the rails were bolted down to a heavy I-beam. Speed of flame hardening these rails was 4 in. per min., and 84 min. were required for each rail section. About 360 cu.ft. each of oxygen and acetylene were used for each rail.

Reclaiming Abrasive Grain

By JOHN ALEXANDER

Some years ago I was given the job of deciding whether abrasive grain could be reclaimed economically from polishing refuse. For this reason, I was particularly interested in the recent discussion in the "Seen and Heard" column "Can Abrasive Dust Be Reclaimed?" (*AM*—Vol. 86, page 931). My studies showed conclusively that (1) abrasive grain reclaimed from polishing refuse is practically as good as new grain and (2) the cost of reclaiming is less than a quarter of the price of new grain.

Our method of reclaiming is to pass the polishing refuse through a revolving barrel furnace. This burns off all glue adhering to the grain, and reduces most of the other dirt to a fine dust. All of this is then passed under a magnet on its way to the screens, the magnet attracting all metallic particles. We have found that No. 80 grit size is the finest for practical use to be obtained by screening through wire sieves. Our practice is to

YOUR SAWING JOBS PRE-TESTED

A typical case: Heyl & Patterson, Inc. of Pittsburgh, Pa. sent a 6½" bronze bushing through our Laboratory.

55 separate cuts were tried
4 different width saws
40 speeds
3 lubricants
Several pressures
Various angles

Result: Use a DoAll 8 pitch band saw, 2 temper, raker set, 1" wide. Tilt table 10 degrees and run at 100 f.p.m.

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This department contains different size and style sawing machines

The Photomicroscope shows grain structure of your metal in minute detail

Exterior view of Saw Research Laboratory

A clinic where hundreds of intricate sawing jobs are handled. This brand new building, with the most modern scientific apparatus is manned by top-ranking engineers. They determine the fastest and easiest method to saw any kind of metal, alloy, Masonite, magnesium, plymetal, etc. with maximum savings of time, metal and saw blades.

HAVE YOU A TOUGH JOB?

Send along the actual job for a series of tests by our experts. They will send you promptly a detailed written report with their findings. No cost or obligation.

DoAll BAND SAWS

Each 100-ft. coil comes in slotted metal box. Complete line contains 48 different styles, ⅛ to 1" wide.

These hard-toothed little fellows last longer and are doing work in plants everywhere in ½, ¼ and even ⅛ the time of former methods. The finish is so smooth that further machining is unnecessary.

Send for 32-page Book

Contains illustrations and facts about actual performance records of DoAll Saws.

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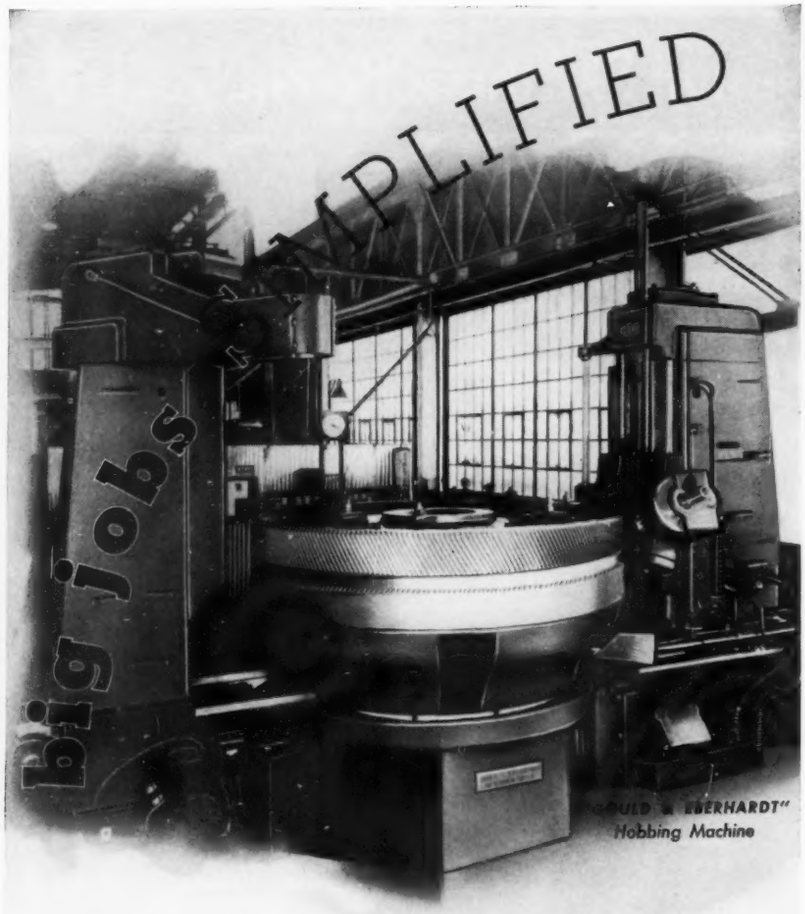

● Mechanical giants which otherwise would demand an operator's continuous attention to oiling—or have their life-span severely cut—are made self-oiling by machine manufacturers' foresight. With BIJUR-equipped machines there are fewer shut-downs . . . less "time out" for repairs and maintenance.

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mix the reclaimed grains with equal portions of new grain in preparing abrasive stock for setting-up polishing wheels.

It is believed that the glue, used as a bonding material in setting-up abrasive polishing wheels, has not sufficient strength to hold the grain until it has been considerably dulled. Also, the abrasive, which is hard and brittle, breaks up into smaller sizes during the polishing operation. The result is that in the reheading of polishing wheels with reclaimed material, the unbroken grains are likely to present different cutting edges than were previously used, and all broken grains have new cutting edges. The breaking down of the grains was proven in our test by the proportionately large quantity of smaller size grains returned in screening the reclaimed abrasive.

Maintenance of Jacks

By F. J. JAKOUBEK

Chief Engineer, Templeton, Kenly & Company

Lifting jacks are subject to considerable abuse. Their useful life can be increased considerably if a few simple rules are followed. They should be properly lubricated and protected against fouling with dirt. In addition, the weight of the load should be conservatively estimated and a sufficient number of jacks used to keep the load on each within its rated capacity.

The following maintenance rules will extend the useful life of lifting jacks:

Automatic Lowering Jacks

1. Check overplay—when the pawl clicks into position, the socket stop should be at least ½ in. away from the housing on both the up and down strokes.

2. Keep spring link clean. Dirt or caked grease interfere with proper spring tension. Wash with kerosene occasionally.

3. Use correct size lever bar or pole—wrong sizes can damage the socket and are dangerous to use.

4. Don't mishandle jacks by using them for mawls or by throwing them on trucks or from other heights. Generally malleable, they may not break, but they get out of alignment.

Screw Jacks

1. In lubricating the screw, machine oil should be used in preference to grease. Be sure that the bearing under the cap is lubricated regularly, using grease.

2. Do not extend the screw beyond the safe limit—roughly not more than two-thirds of the screw should be run out.

3. Use good blocking under the base and above the cap, if necessary.

4. Clean the screw and housing or

base occasionally to remove grit, and then relubricate.

Hydraulic Jacks

1. Keep oil in reservoirs at the correct level. Refill with proper grade of oil. Do not expect maximum lift if reservoir lacks oil.

2. Keep the ram or sleeve as clean as possible, and free of nicks and dents. A clean ram will not carry dirt down into the cylinder.

3. Do not use a longer lever bar than the one supplied with the jack. A longer lever makes it possible to lift a heavier load than the jack was intended for, resulting in a damaged jack if not an accident.

4. Pay particular attention to the blocking—be sure it extends under the entire base, including the pump to one side of the housing or cylinder.

5. Be sure that nuts at the top and at the base of housing are tight.

6. On those hydraulic jacks where the release valve is not shielded, be sure it is not struck or damaged.

7. Do not throw jack down, or hammer it under load. Never allow anything to strike the pump as so doing can damage it beyond repair.

Machining High-Nickel Alloys

By R. H. McCORMICK
Vascoloy-Ramet Corporation

Extremely high chip pressures result when machining the high-nickel alloys because the chips are not easily deformed and resist breaking away from the work. It is necessary, therefore, to use rake angles which make the tool more free-cutting. We have gone as high as 25 deg. for side rake angles. The positive back rake angle should not be less than 8 deg. with relief and clearance angles held to a minimum so as to support the cutting edge.

With such steep rake angles, deep cuts with relatively light feeds tend to lighten the chipload. Speed should be stepped up higher than what normally would be used for a given depth of cut and feed. This higher speed will reduce the tendency toward a built-up edge and, also, will aid in breaking the chip.

Cemented carbides have not been generally successful in machining these high-nickel alloys. This is because the carbide tip has a tendency to chip under such steep rake angles. However, in many instances the high tantalum carbide grades, such as Vascoloy-Ramet grades *B*, *X* and *XX*, have been successful. The peculiar lubricating quality of tantalum carbide definitely reduces the tendency of high-nickel alloy chips to adhere to the tool face.

The cast, non-ferrous alloy Tantung has worked out successfully in the machining of Monel and nickel-chromium heat-resistant alloys. This is due, primarily, to the greater toughness of this material, which permits the use of

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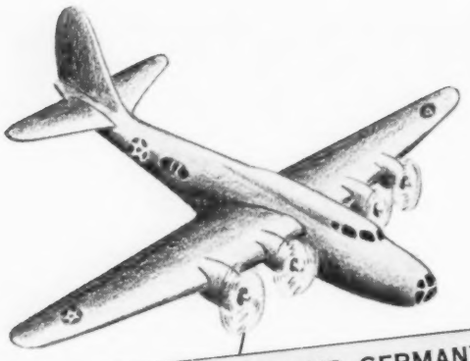

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. . . and they all took off from this tiny block

Planes like the American Flying Fortresses just don't happen—it requires the combined efforts of designers, engineers and all sorts of technical men to conceive and construct planes of this type.

Yes, it requires highly skilled men to put these flying fortresses into the air, but it also requires the production of thousands of precision parts by both small and large companies before these planes can be manufactured on a production basis.

These plants, scattered over the entire country, are pouring finished parts into the assembly plants in an ever-increasing stream. There inspired men are working day and night moulding them into the finest aircraft in the world. What makes all this possible? —The Gage Block—standard of measure and the controlling factor in the manufacture of interchangeable precision parts.

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W	—OR "WORKING SETS"	"W" accuracy is a guaranteed tolerance of ± .000008 inch per inch or fraction thereof, of gage.
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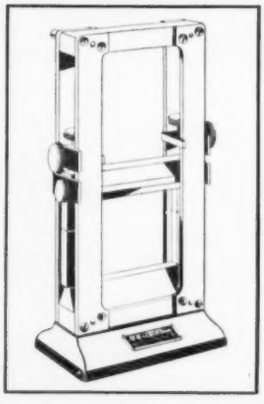

Here is how to set your Internal Indicators more Efficiently

Today, it is just as important to increase your efficiency in setting your internal indicators as it is to increase the efficiency of your production lines. Yes, valuable time is wasted by letting your men use the old-fashioned method of setting internal indicators by using clamps and parallels with gage blocks. By using this new Ellstrom Internal Setting Gage, they can set indicators more quickly and accurately so that more of their time can be used on production work.

steep angles and higher speeds without the cutting edge chipping. The tantalum carbide in Tantung enhances its value as a cutting tool for these alloys.

One manufacturer recently did some development work to determine proper cutting angles in applying Tantung to Monel bar stock in a Warner & Swasey turret lathe. For turning a 1-in. diameter bar with a tangent box-type tool the following angles are used: Side rake angle, 22 deg.; back rake angle, 5 deg.; side relief angle, 8 deg.; side cutting edge angle, 0 deg.; front relief angle, 8 deg.; end cutting edge angle, 5 deg.; nose radius, 1/64 in. Using a cutting lubricant made up of three parts paraffin oil and one part of "Umbre" cutting oil, a cutting speed of 148 ft. per min. and a feed of 0.015 in. per rev., 52 pieces are produced per tool grind.

So far as cutting fluids are concerned, we have used soluble oil, sulphur-containing oil and have cut the materials dry. There seems to be no difference in the character of the surface whether a lubricant is used or not. There are differences in the effects of various sulphur-bearing oils upon cutting alloys of this type, and the influence of a specific lubricant upon tool life should be investigated. In many cases, best results are obtained with the tools dry.

Tumbling Barrels

Removal of burrs by tumbling is not as simple as it may seem. The old foundry tumbler or "rattler" was much in evidence by its ungodly noise, and the problem was simply to knock off most of the rough parting projections and get the sand off and out of the castings. But the removal of burrs from stampings, or sharp corners from machined pieces, or the polishing of flat and other surfaces is a study in itself.

Some years ago the National Cash Register Company did a lot of experimenting with tumbling as a means of burring and finishing many of their small parts. Tbey found many interesting problems that few of us ever dreamed of before. Many factors affected results obtained such as size and shape of tumbling barrel, direction of rotation (end over end, twisting or wobbling), speed of rotation, amount of work and other materials put in barrel, kind of abrasive, amount of water used and more factors than seemed possible. The use of miscellaneous metal pieces to strike the work as the barrel revolves, substitution of balls of various sizes, use of pebbles, abrasives and sawdust, the waxing of sawdust or wooden pegs, the amount and kind of liquid used and the extent to which the barrel is filled with work and other materials.

If tumbling does not give the results expected, try varying such things as the speed, shape of barrel and other factors just mentioned.

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PHYSICAL PROPERTIES CLOSELY CONTROLLED

Through the application of exclusive metallurgical principles, plus the accurate regulation of every step of the manufacturing process, MEEHANITE foundries are able to control closely the physical properties of castings, thus producing the characteristics called for by the job the castings perform.

GENERAL ENGINEERING TYPES

With tensile strengths (as cast) up to 55,000 p. s. i., MEEHANITE castings are available in six distinct types for general engineering applications.

HEAT RESISTING TYPES

MEEHANITE is made to specifications that provide several types of castings resisting growth, warpage, and scaling under high temperatures.

WEAR RESISTING TYPES

Five different types of wear-resisting MEEHANITE have been developed, each having a different combination of the physical properties that affect wear. These include: hardness, impact, fatigue, friction, corrosion, grain structure, density, toughness, etc.

CORROSION RESISTING TYPES

Experience in actual service has shown that several types of MEEHANITE have exceptional corrosion-resisting properties, particularly under high temperatures.

HEAT TREATMENT

Castings of high strength and hardness are readily obtained in MEEHANITE through heat treatment and flame hardening.

ENGINEERING DATA

Write for the MEEHANITE Handbook giving engineering, descriptive, and application data on MEEHANITE.

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One of these oils and the job it is doing is described at the right. If you are just retooling for war work or are still finding it difficult to get the necessary accuracy, finish and tool life on converted machines, call in a Standard cutting oil specialist. See if one of these new oils—and the Engineers' experience in applying them—can help you.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

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Heavy Broaching, Threading, and Machining Soft Steels. Stanicut 309 BCS is especially designed for machining soft steels or those which tend to tear easily and make it difficult to get good finish. It may be blended with paraffin oil for less severe conditions.

A typical Stanicut 309 job is hobbing 51-tooth gears out of blanks 10½ inches in diameter, 1¼ inch face, made of 4140 steel with a Brinnel of 252. The cutting oil previously used was permitting the chip to weld to the tool and tear bits off the edge. Hob life was too short. Stanicut 309 was applied. This oil is higher in active sulfur, contains compounding, and acts as an anti-flux, as well as a coolant. Hobs now last three times as long with Stanicut.

SEE NEXT PAGE FOR OTHER JOBS

STANDARD OIL COMPANY (INDIANA)

Here are some new jobs

NEW STANICUT OILS

can do better . . .

Machining steels lower in machinability rating. Stanicut 126 BCS is a new oil developed for machining A1335 and similar steels that are harder to machine than free cutting screw stocks. Gives excellent tool life. Here's a recent, and somewhat unusual, use of Stanicut 126:

The job was drilling and reaming 2 in. dia. holes in a 2 inch slab of 1040 cast steel in making gun mounts. Stanicut 126 doubled production and improved drill life and finish by allowing increased drill speeds without overheating or breakage.

Machining tough aluminum alloys. Stanicut 62 FC gives considerably better tool life and finish than kerosene and lard oil blends commonly used for machining tough aluminum alloys. In addition, this oil contains no active sulfur and can be used for machining copper or brass. This eliminates changing oil when both aluminum and copper are worked in the same machine. The higher flash point decreases the fire hazard.

High speed automatic work on free cutting steels. Stanicut 107 BC is also suitable as a coolant where carbide alloy tools are used, and can be used on high speed machining on copper and brass, without danger of staining the work. Stanicut 107 sometimes works well on harder steels too, as shown by this unusual case history:

Stanicut 107 BC increased tool life 75% in slotting cooling fins of airplane engine cylinders from 1050 steel tubing. Tool consisted of 18 bits per tool head, spaced 1/8 in. apart. Width of bit 3/16 in. Depth of cut 7/8 in. Feed .002 in. per revolution. Stanicut 107 kept work cool and saved considerable shut-down for tool grinding.

Machining steels of the S.A.E. 3000 to 4000 Series. Stanicut 155 SC contains the maximum amount of active sulfur that it is practicable to incorporate in a transparent oil. It is giving excellent results on the tougher alloys, especially those that tend to "smear" and leave a poor finish with ordinary cutting oils.

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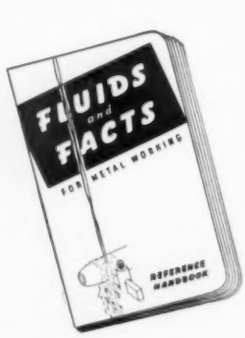

Ask your Standard Oil man for this valuable handbook. "Fluids and Facts for Metal Working" is a handy, pocket-size manual packed with 50 pages of facts and tables useful to shop men—conversion tables—machinability ratings—spindle speeds vs. surface speeds—cutting oil recommendations, etc. Take time to see a Standard Oil representative next time he calls. He'll have a copy for you.

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The GIRL and the GRINDER

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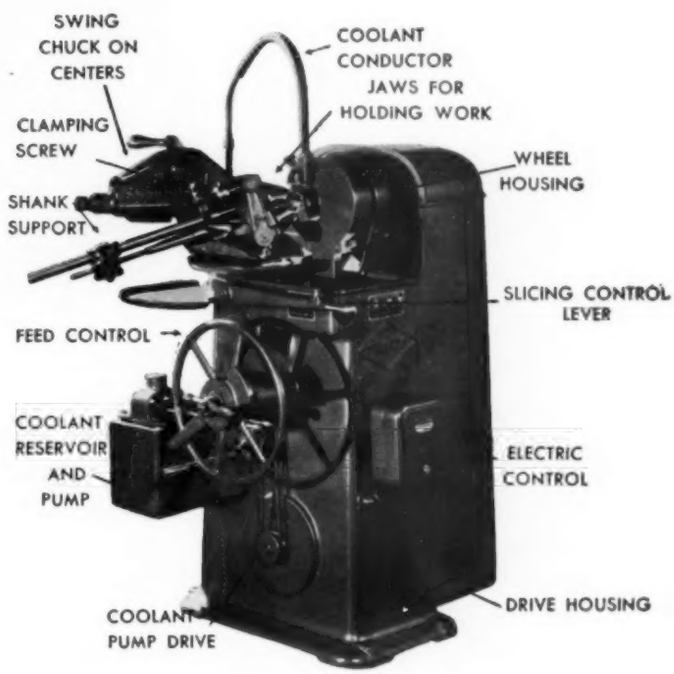
Releasing needed manpower for our 7,500,000 Army (and for all the other Services) Girls in Industry are rendering a patriotic service that will not be forgotten. For the production lines of U. S. industry must not slacken . . . must, in fact, be speeded up, and at the same time all possible manpower must go into our armed forces. Girls in Industry are making this possible . . . and tools like Sellers Drill Grinders are helping.

Drills are a vital factor in production, and Drill grinding therefore is a daily necessity in all large plants. Fast, accurate drill grinding insures clean round drilled holes and prevents production delays. The simplicity of the Sellers Drill Grinder makes it possible for these girls to grind the largest as well as the smallest drills to precision accuracy and with a speed that is astonishing.



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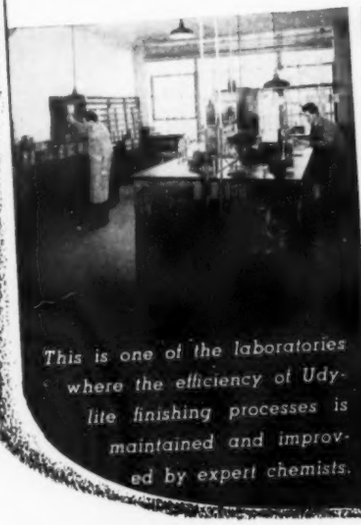
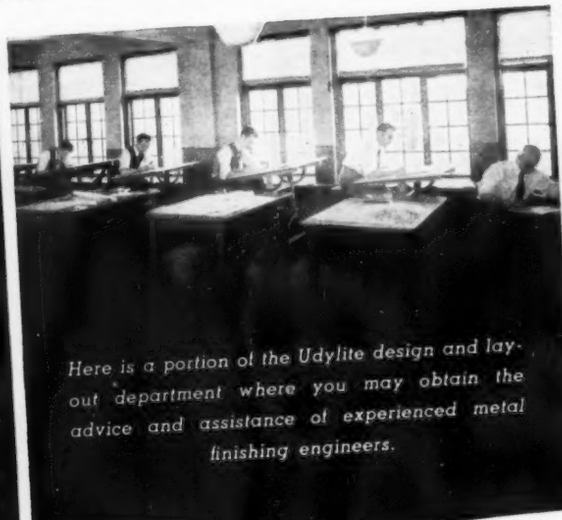
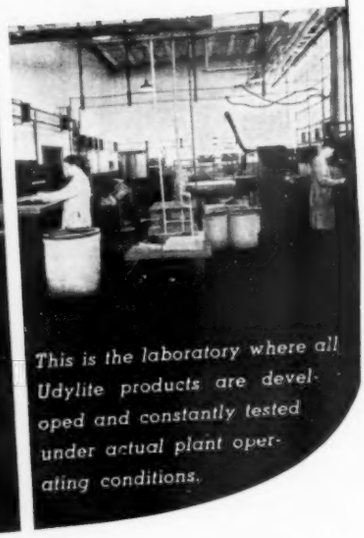


This is one of the laboratories where the efficiency of Udylite finishing processes is maintained and improved by expert chemists.



Here is a portion of the Udylite design and layout department where you may obtain the advice and assistance of experienced metal finishing engineers.



This is the laboratory where all Udylite products are developed and constantly tested under actual plant operating conditions.

★ ★ ★ ★

For prompt, dependable metal finishing information, call on Udylite. No organization is better equipped to give you information gained from installing plating, polishing and anodizing departments in many leading manufacturing plants throughout the country. ● **Trained plating engineers and electrochemists are** at your service. These men *know* metal finishing and they can help you plan a new installation or revise your present one for greater efficiency. They know, also, that you want information quickly. ● **Udylite has a complete line of equipment** . . . second to none in terms of quality and efficient performance. ● **and supplies** . . . for every metal finishing need. Salts, acids, anodes, buffing and polishing materials—everything required. ● Call Udylite for prompt service on your finishing requirements. You pay no more for Udylite dependability.

THE UDYLITE CORPORATION

1651 E. Grand Blvd., Detroit, Mich.

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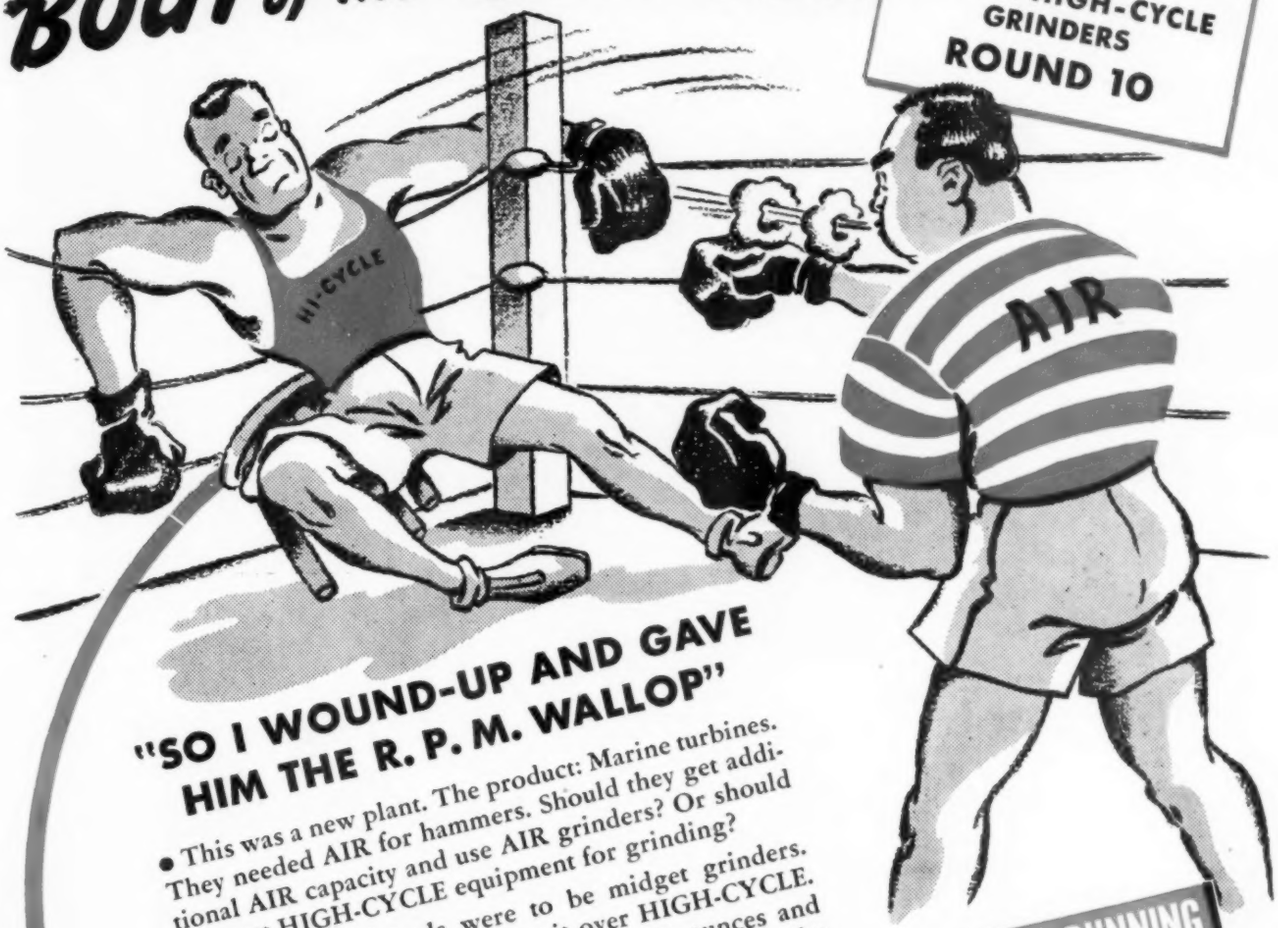
BOUT of the O'TOOLS

10 ROUNDS—AIR VS. HIGH-CYCLE GRINDERS
ROUND 10



"SO I WOUND-UP AND GAVE HIM THE R. P. M. WALLOP"

• This was a new plant. The product: Marine turbines. They needed AIR for hammers. Should they get additional AIR capacity and use AIR grinders? Or should they get HIGH-CYCLE equipment for grinding?

Many of the tools were to be midget grinders. That's where AIR usually has it over HIGH-CYCLE. The tools weigh only a pound and two ounces and run at 20,000 R.P.M.—half the weight and twice the speed of the HIGH-CYCLE grinders.

So, in this Round 10, AIR got the decision and 77 Rotor AIR Grinders went to work.

How's *your* portable tool production? Call in the Rotor Analyst for maintenance tips that will help win the war! He has valuable suggestions and aids to make your tools produce more and last longer.

This wall chart is part of the Rotor Tool Conservation Plan. Aids for maintenance of AIR and HIGH-CYCLE tools free on request.

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Mallory Spot Welds Aircraft Contact Assemblies Fast... and They Need No Heat Treatment!

Electrical contact sub-assemblies made by Mallory for aircraft relays have to pass exacting tests. One such assembly consists of a small contact element that has to be joined to a flat metal spring. This spring is tempered stock, and the problem was to accomplish an assembly needing no further heat treatment . . . to make a firm bond, yet retain the spring's temper.

Mallory engineers, with their long experience in both metallurgy and resistance welding, quickly found the answer to this problem. Now, with Mallory methods, aircraft relay sub-assemblies are completed at high speed. The spot welding, with Mallory Standardized Spot Welding Tips, is performed so accurately that only a minute portion of the spring is annealed. *Results:* No subsequent heat treatment required. A low-cost aircraft contact assembly that passes all performance tests!

In many war industries, resistance welding electrodes designed and standardized by Mallory . . . for spot, seam, flash or butt welding . . . are speeding production and cutting fabrication costs. Mallory-developed alloys consistently show a vast superiority over other electrode materials . . . producing more welds between dressings . . . a higher total number of welds before replacement is necessary . . . and sound, clean welds that assure top performance for the finished product . . . whether it's a fighter's fuselage or a destroyer's deckhouse!

Information, Free! Write us today if you haven't received your copy of the fact-filled Mallory Resistance Welding Data Book. If you're fabricating aluminum, you'll need Mallory's new treatise, "Spot Welding Aluminum Alloys". Mail your name and address to us now!

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • *Cable Address*—PELMALLO

RESISTANCE WELDING **P. R. MALLORY & CO. Inc. MALLORY** **STANDARDIZED ELECTRODES**

Ships

Appreciates Help Like This: Marine steering engine manufacturer says, "Thanks for assistance in setting up our new production line . . . Materially speeding up production . . . Especially appreciate your prompt parts and repair service."

Railway Cars

In Car and Engine Shops, Black & Decker Tools are being used to advantage in helping build up America's rail transportation. Here a Black & Decker super service Valve Refacer is grinding valves for a Diesel engine.

Helping MOVE . . . as well as MAKE
WEAPONS FOR VICTORY

Motor Trucks

To Keep 'Em Rolling Faster, Black & Decker Tools are doing dozens of important time-saving jobs on the automotive front. B&D Screwdrivers and Nut Runners are used extensively in the maintenance and production of motorized equipment.

"Flying Boxcars"

Top Tool for Aircraft: Speedy, husky Black & Decker Holguns (shown here) are used extensively on aircraft assembly operations, from swift fighter craft to the gigantic new "Flying Boxcars" so sorely needed on vital supply lanes.

BLACK & DECKER TOOLS are in action today on all war production fronts—helping build fighting equipment for our Armed Forces—then helping deliver it by speeding the output, maintenance and repair of land, sea and air transport equipment.

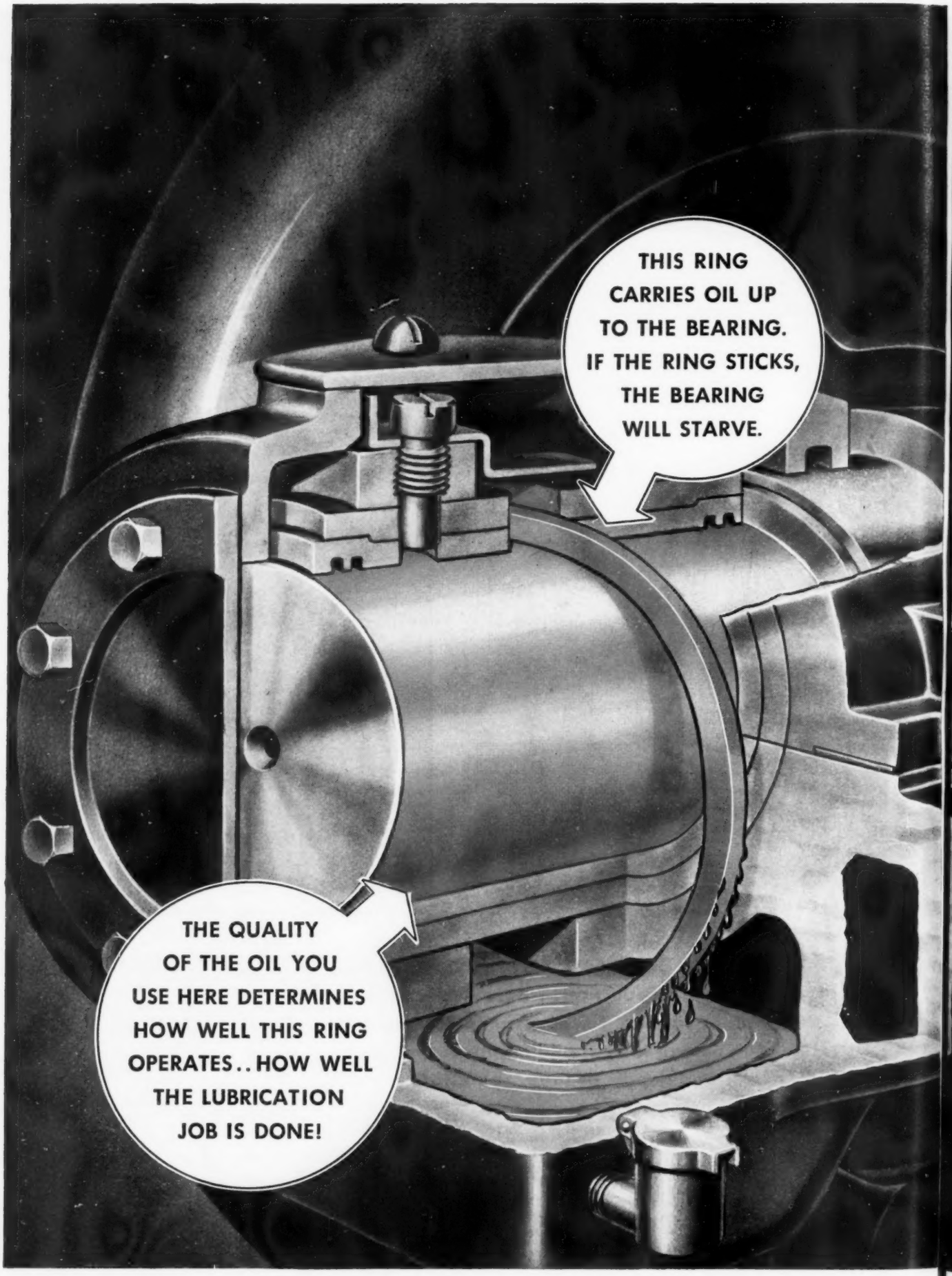
HELP FOR YOU . . . in a Hurry!

On any portable electric tool problem get in touch with your nearby Black & Decker Distributor today. He'll show you that in the complete line of Black & Decker Tools there's one built precisely to *fit the job*. He's dependable, convenient—ready to serve you as a source of supply, or as a "tool information expert." The Black & Decker Mfg. Co., 716 Penna. Ave., Towson, Md.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS


THIS RING CARRIES OIL UP TO THE BEARING. IF THE RING STICKS, THE BEARING WILL STARVE.
THE QUALITY OF THE OIL YOU USE HERE DETERMINES HOW WELL THIS RING OPERATES.. HOW WELL THE LUBRICATION JOB IS DONE!

If This Ring Sticks You're Stuck!

WARTIME DEMANDS MAKE THE HIGHEST QUALITY LUBRICANTS FOR ELECTRIC MOTORS A "MUST"!

Problem: Look at the ring in the picture at the left. It must pick up oil from the well beneath the bearing and deliver it to the top of the journal. If the oil is too thin, not enough oil will reach the bearing. If it is too thick or if deposits are formed, the ring may stick and "starve" the bearing.

Answer: *Gargoyle Etna Oil Heavy Medium* is a special, electric-motor oil of correct body. Its high stability effectively resists oil thickening and the formation of deposits that may cause the ring to stick. The result is, the bearing is assured an ample supply of oil.

For grease-lubricated, electric-motor bearings, we recommend *Gargoyle Greases BRB.* These anti-friction bearing greases offer great resistance to oxidation. This and their tenacious films protect the polished surfaces against corrosion and wear. They will not form hard, soapy deposits that restrict the free movement of balls or rollers. They help minimize leakage.

TO HELP MAINTAIN WARTIME PRODUCTION, CALL IN

SOCONY-VACUUM for "Correct Lubrication"

GARGOYLE Lubricants

SOCONY-VACUUM OIL CO., INC. — Standard Oil of N. Y. Div. — White Star Div. Lubrite Div. — Chicago Div. — White Eagle Div. — Wadhams Div. — Southeastern Div. (Baltimore) — Magnolia Petroleum Company — General Petroleum Corporation of Calif.

*"Machines without cutting tools are no more effective than guns without ammunition"**

Moved by pride in fine craftsmanship, making use of all the engineering skill that science can command, manufacturers of power driven metal working equipment are supplying industry with an ever widening variety of machines.

But these machines, no matter how powerful, how cunningly designed they may be, are impotent, utterly unable to do their job, until they are equipped with metal cutting tools that actually do the creative work.

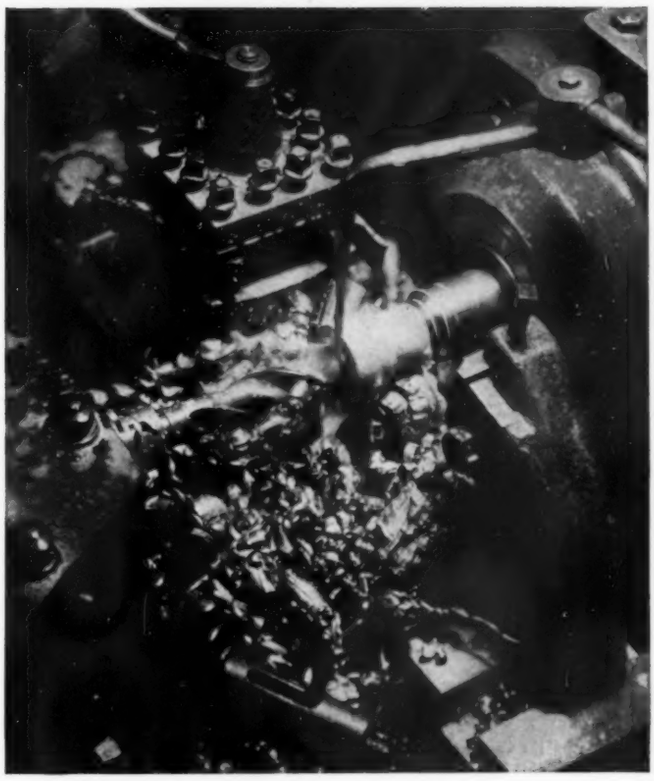
The production of these cutting tools has been our specialty for many years: first in a small shop, next in greatly enlarged quarters and now in a modern plant devoted exclusively to the correct design and manufacture of standard, special and Gair-Lock inserted blade cutters— the *business ends* of machine tools.

THE GAIRING TOOL COMPANY
Detroit, Michigan

GAIRING
FOR A
QUARTER CENTURY
SPECIALISTS
IN FINE
CUTTING TOOLS

* Alfred Herbert, English machine tool builder, writing in *The Engineer* (London)

There is only one perfect Cutting Oil for your particular job!



A cutting oil problem can turn into a bottleneck that slows production, delays schedules, squanders time. This is especially true today—for wartime specifications are rigid and exacting . . . and priorities have introduced many new and unfamiliar materials.

The problem is *to find the one perfect cutting oil for your particular operation*—a cutting oil that will assure *more production, better finish, faster turnover.*

Why not get the benefit of our experience? We'll be glad to have a Cities Service lubrication engineer consult with you on the problems of your particular job. This service is yours for the asking. Just phone or write our office nearest you, today!

An informative booklet, "Metal Cutting Lubrication," is available to cutting oil users. Simply fill out and mail the coupon below. There is no obligation, of course.

OIL IS AMMUNITION—USE IT WISELY!

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Room 1326, Sixty Wall Tower, N. Y.
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Please send me booklet on "Metal Cutting Lubrication." A.M.

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A LUBRICANT FOR EVERY INDUSTRIAL NEED

WORK IT HARD, BUT GUARD IT WELL

OF COURSE, you are driving your Aluminum Alloy equipment to the limit. We need every gallon, every pound, every foot, every piece of the products that can possibly be produced to help win the war. But, bear in mind that you must make your equipment last a long time.

YOU CAN lengthen the life of hard-working, irreplaceable Aluminum Alloy equipment. Here are some ways of doing it; each must be engineered to suit the problem.

CATHODIC PROTECTION has proved effective where the chemicals or cooling water employed are corrosive. Simply add zinc strips in the right places, and the corrosive attack is stopped or slowed down considerably. Alcoa engineers, with years of research on such problems, can advise you on how and where to place those zincs.

PROTECTIVE COATINGS offer another means of making Aluminum Alloy parts last longer. Corrosion-resisting, pure Aluminum coatings can be applied by spraying. Oxide finishes are produced by chemical and electrolytic treatment. Baked resin coatings are very effective, where Aluminum is subjected to severe attack.

METALLIZING—building up worn, corroded, or damaged Aluminum parts with new metal—will give these parts a new lease on life.

INHIBITORS may be the key to longer life of Aluminum Alloy processing equipment. Only a few parts of inhibitor per million of liquid are needed to deprive corrosive materials of their kick. Here again, the research of Alcoa engineers will guide you.

ALCOA ENGINEERS stand ready to help you get every possible hour of service out of your Aluminum Alloy equipment. Write and tell us your problems. Aluminum Company of America, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

Announcing the NEW **GORTON** **SPIT-FIRE**

ELECTRIC ARC ETCHING MACHINE

VERSATILE—DOES LIGHT OR DEEP ETCHING JOBS LIKE THESE—*Large Photo at Top*—Close-up of Etcher applied to a High Production Job. Parts are ball sockets. Each part completed in 15 seconds—240 per hour. *Other photos above* show adaptability to etching an almost endless variety of sizes and contours, inside Cylinders, Cavities, on V-Blocks, Gages, Gears, Rods, Hardened Pins, etc.

For Accurate HIGH PRODUCTION ETCHING

and Permanent Identification of Parts, Tools, etc.

A NEW GORTON DEVELOPMENT—"Spit-Fire" Electric Arc Etching—provides the answer to urgent war plant demands for an All-Purpose Production Etcher which *deeply etches hardened parts without burr in minimum time.* Now in use by largest companies.

MARKS GOODS IN FINISHED STATE at speed of 120 arcs per second with pantograph machine accuracy. Produces an etch improved in legibility, clean-finish and uniformity. Most efficient on highly polished or ground surfaces, large or small, or on delicate parts such as .0015" Feeler Gage stock.

PERMANENTLY ETCHES—LIGHT OR DEEP from .0001" to .003" deep, and from .0075" to .015" wide—on soft to hard metals, including hardest steels—ANY SHAPE, on flat or irregular surfaces or any curvatures—*without Forming Guide.* Automatically follows contours with vertical movement up to 3/8".

SIMPLE OPERATION—QUICK SET-UPS—Uses unskilled operator, man or woman. Etching is precision-controlled through pantograph tracing from master. Usually no preparation of work needed. Requires no acid, no pressure, stress or strain. Overcomes problem of metal fatigue—no fissures, no flaws result. Operates on 110 to 120 volts, 60 cycles AC only. Etching voltage, 3 to 9 volts. Current consumption 25 watts, maximum.

PRESENT DELIVERIES
2 to 4 WEEKS

AVAILABLE TWO WAYS
Complete Etching Machine
or
Portable Etching Unit
for Other Machines

MODEL A-E ETCHING MACHINE

Equipped with complete "Spit-Fire" Etcher Unit. A simplified Gorton Pantograph machine, developed for best results with the "Spit-Fire" Etcher. Has rugged column and table. Etcher head attached directly to pantograph. Choice of 3:1 or 6:1 fixed ratio pantograph. (Adjustable Pantograph providing 3:1 to 100:1 optional at extra cost.) Model A-E Etching Machine, with "Spit-Fire" Etcher Unit. Price **$775**

ETCHER HEAD AND CUTTER SPINDLE INTERCHANGEABLE—The "Spit-Fire" Head can be installed or removed in a few moments. An ideal set-up for high production work, the tool room, or those odd etching jobs in small shops.

PORTABLE ETCHER UNIT

Available separately for those already owning a pantograph machine and whose work does not justify purchase of the complete etching machine above. The "Spit-Fire" Unit fits any make of conventional pantograph machine. Just remove spindle and slip Etcher shank in its place. Unit consists of Etcher Head, Control Panel with Pilot Light, Transformers, Cables, 36 Electrodes, assorted sizes—in convenient carrying case. Order No. 828-2. Price **$220**

Write for FREE Bulletin 1635A for Full Details

GEORGE GORTON MACHINE CO.

1315 RACINE STREET, RACINE, WISCONSIN, U.S.A.

39 Years SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING

That's the Record of EN-AR-CO PROMAX CUTTING OILS

● In a wide range of industries . . . on a vast number of machining operations, En-Ar-Co PROMAX Cutting Oils permit *higher surface speeds* and heavier cuts with better finishes . . . all with greater production between tool grinds.

For instance . . . in the production of projectiles for the U. S. Government, PROMAX Cutting Oil *increased production between tool grinds 30%* and *elimtinated discoloration of copper parts.*

With the insistent demand for greater and greater production . . . with closer and closer tolerances, it becomes highly profitable to look into the performance records of PROMAX Cutting Oils.

Write today about the type of PROMAX Cutting Oil best adapted to your individual production needs.

● For over sixty years The National Refining Company has pioneered in the development of Industrial and Motor Car Lubricants. Our engineers are at your service to help you solve your lubrication problems.

EN-AR-CO INDUSTRIAL LUBRICANTS

THE NATIONAL REFINING COMPANY

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Serving America for More Than 60 Years

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BALTIMORE Teletype CG. 605 BRUnswick 2000
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Call Scully for
NATIONAL EMERGENCY ALLOY STEELS

TO save critical materials such as nickel and chromium, "National Emergency Alloy Steels" have been developed as substitutes for the old style alloy steels. These new alloy steels cover a wide range of properties and were especially designed to meet present conditions. Many of them are actually out-performing the steels previously used.

Our stock of these "National Emergency Alloy Steels" is now coming in. We welcome your inquiries and orders and would be happy to assist you in determining the grades best suited to your needs.

Telephone, wire or write the Scully Warehouse nearest you—see phone and teletype numbers above.

Do you lack steel to complete a rush war job? Is your production in danger of being slowed down or stopped for want of some piece of steel or steel product? Then call the nearest Scully warehouse. Many such calls have kept wheels turning. If we don't have what you need, you can be sure that we'll do everything possible to help you get it.

Our first job, like yours, is to speed war production. Every one of our warehouses is on the job day and night. And although our stocks of steel are not what we wish they were, what we have can be yours in a hurry—subject, of course, to priority restrictions. So try Scully—note our phone and teletype numbers above.

Scully Service

USS

SCULLY STEEL PRODUCTS COMPANY

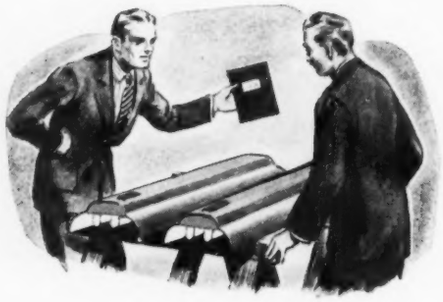
Distributors of Steel and Steel Products

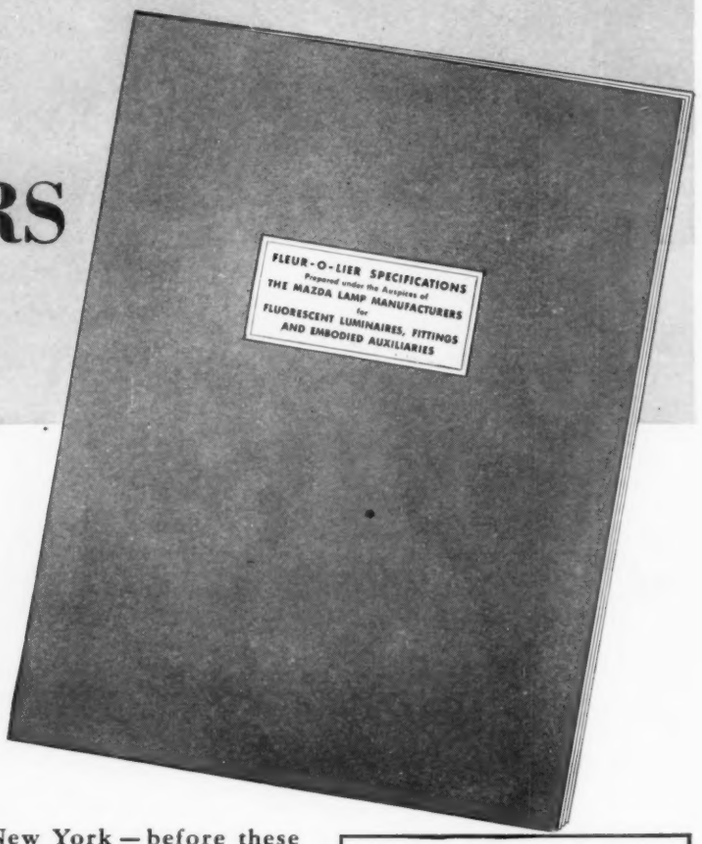
Warehouses at CHICAGO · NEWARK, N. J. · ST. LOUIS · BOSTON
ST. PAUL-MINNEAPOLIS · CLEVELAND · PITTSBURGH · BALTIMORE

UNITED STATES STEEL

Planning war plant lighting? First get these specifications . . .

learn why FLEUR-O-LIERS are right!





1. These manufacturing specifications for Certified FLEUR-O-LIER fixtures have been written to protect those who *specify* and those who use fluorescent lighting. Skilled lighting engineers of the MAZDA Lamp manufacturers put their full knowledge into the setting up of these standards—to assure you of highly satisfactory service from fixtures and efficient performance from lamps.

2. No specifications are more complete. They cover not only reflectors but auxiliaries (ballasts and starters) as well—a full check on electrical, mechanical and lighting performance.

3. This information takes you "behind the scenes." It gives you full details of how fixtures built to these specifications are tested and checked by Electrical Testing Laboratories, Inc., of New York—before these impartial experts issue the right to use the famous FLEUR-O-LIER Certification Label. Over 40 leading fixture manufacturers are already making fixtures to these standards and participation in the program is open to *any* manufacturer who complies with the FLEUR-O-LIER requirements.

4. Plant engineers, architects, purchasing departments can have the full assurance that fixtures bearing the FLEUR-O-LIER label have been *Certified* by Electrical Testing Laboratories as meeting all of these specifications—making unnecessary any further test or check by the user.

★*A request on your business letterhead will bring the actual fixture specifications to you promptly. Write NOW to FLEUR-O-LIER MANUFACTURERS, 2133-11 Keith Bldg., Cleveland, Ohio.*

Covers such important points as:

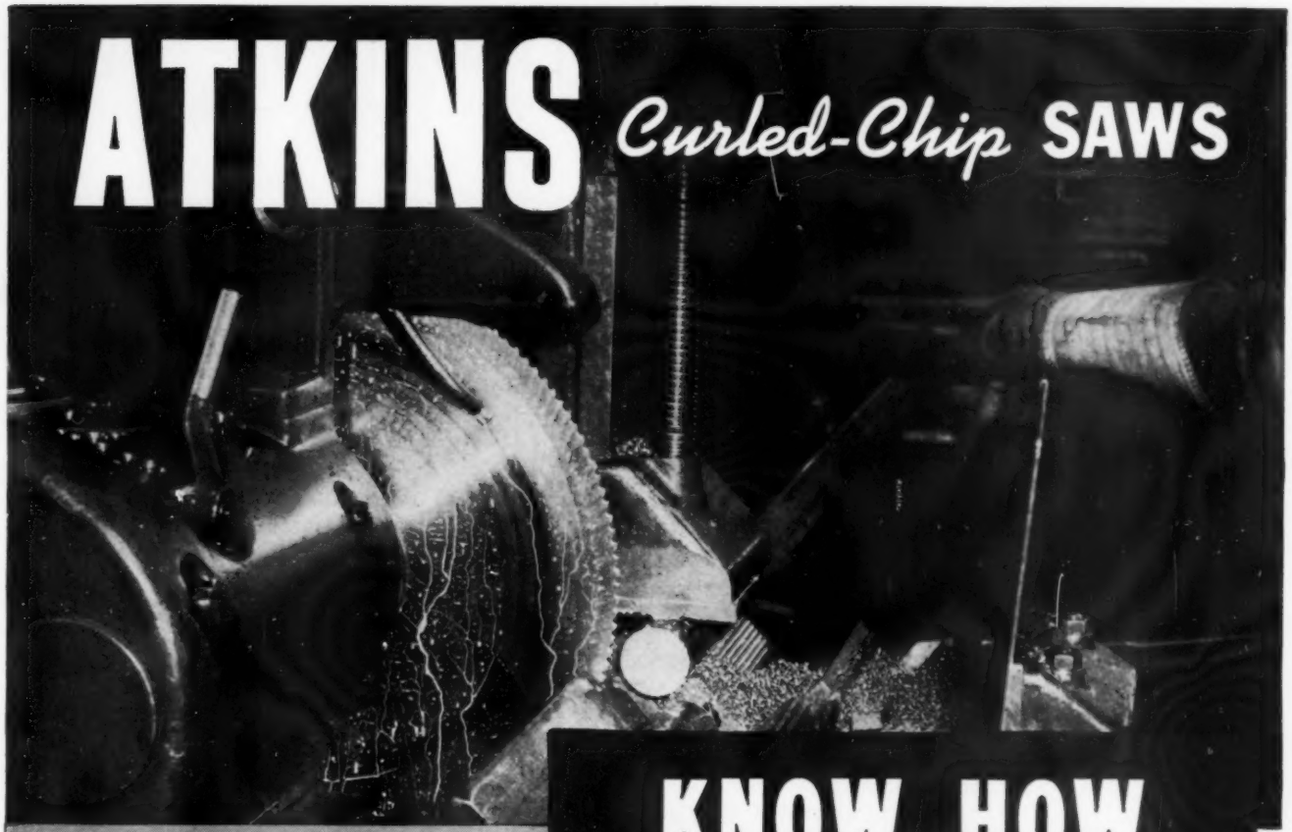
Efficiency—safety—construction—finish—brightness—flicker correction—listed materials—high power factor—ballasts and starters—temperature rise.

FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

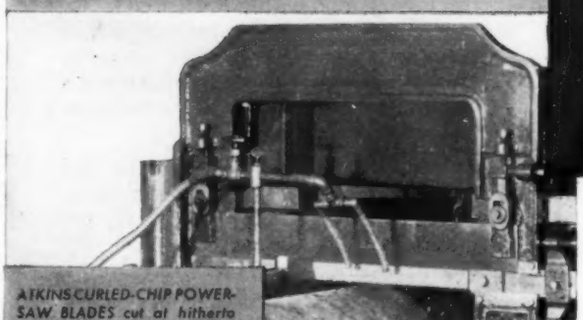
Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

ATKINS *Curled-Chip* SAWS

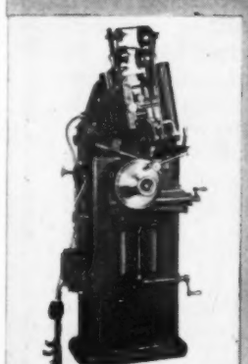


ATKINS SEGMENTAL CURLED-CHIP COLD SAWS meet all requirements for fast work on heavy-duty metal sawing. Teeth replaceable in segments permit replacing worn-out teeth without discarding saw disc

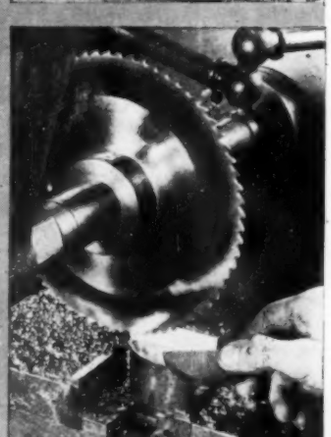
KNOW HOW
To Save Critical Metals,
REDUCE MACHINE WEAR ON CUTTING OPERATIONS



ATKINS CURLED-CHIP POWER-SAW BLADES cut at hitherto unattainable rates of speed... can be reground if set is not worn out, saving materially on tool requirements.



Atkins offers expert re-grinding of Curled-Chip Saws on automatic indexing metal saw grinders from strategically located re-grinding depots.



ATKINS CURLED-CHIP CIRCULAR MILLING SAWS cut remarkably fast yet hold their edge for longer periods between grindings.

★ Atkins Engineered Cutting Service

The right saw, *used right*, is the answer to production problems on metal cutting operations. On that basis, Atkins Curled-Chip Saws of the type and used in the way recommended by an Atkins engineer, are doing a stand-out job throughout industry.

The right saw, *used right*, is also the answer to the critical problem of tool and machine maintenance. Because of their scientific tooth design, Curled-Chip Saws last longer. Fewer saws are needed to cut a given amount of material.

Curled-Chip Saws cut faster—incredibly faster in any number of recorded instances. Cutting more metal in less time saves wear and tear on machines.

And Curled-Chip Saws cut cleaner, reducing re-machining operations. This opens up still further possibilities for savings in tools and equipment.

To help you conserve vital metals and machines on cutting operations, call on Atkins Engineered Cutting Service for practical help. Write us today.

E. C. ATKINS AND COMPANY · 424 S. Illinois Street
Indianapolis, Indiana

CHOOSE THE RIGHT SAW...
USE THE SAW RIGHT

SOME WAYS TO CONSERVE TOOL STEEL

HINTS on annealing

If a forged tool is to be machined or ground, prior to hardening, it must be annealed. Since annealing temperatures range from 1300 to 1650 deg. F., depending upon the grade of steel and the desired microstructure, special care is needed to protect the steel from scaling and decarburization.

If possible, anneal tool steel in a controlled-atmosphere furnace. Where such a furnace is not available, pack-anneal in a sealed container with mica, coke breeze, or other suitable carbonaceous material. Either method requires slow heating from a low temperature to the annealing temperature, and the tool steel should be held in the furnace until thoroughly heated through.

Furnace-cool the steel if at all possible. If not possible, the still-hot container may be removed from the furnace and cooled slowly by burying in dry ashes, silocel, lime or other retardant medium, although this practice is not recommended.

Tool steel bar stock is usually furnished in the annealed condition, and hence does not require further annealing prior to machining or treatment. However, if annealed bar stock is subjected to severe machining operations, stresses are frequently set up. These can be removed by a sub-anneal at around 900 to 1100 deg. F. When high-speed steel is involved, a full-anneal is recommended.

NORMALIZING—Certain types of tool steel should be given an intermediate heat-treatment between forging and annealing. This treatment, called normalizing, conditions the steel so that it will react better in subsequent operations. Normalizing involves a slow heating of the steel to between 1600 and 1700 deg. F., soaking until uniformly heated, and then air cooling. Normalizing refines grain structure, relieves forging stresses, and produces a more uniform structure in the steel.

However, due to the air-cooling, there are stresses set up in the steel. For this reason do not normalize high-speed steels or high-carbon, high-alloy steels, as these are easily air-hardened and hence subject to dangerous cooling stresses. Whenever normalizing is used, always anneal immediately after the normalizing has been completed.

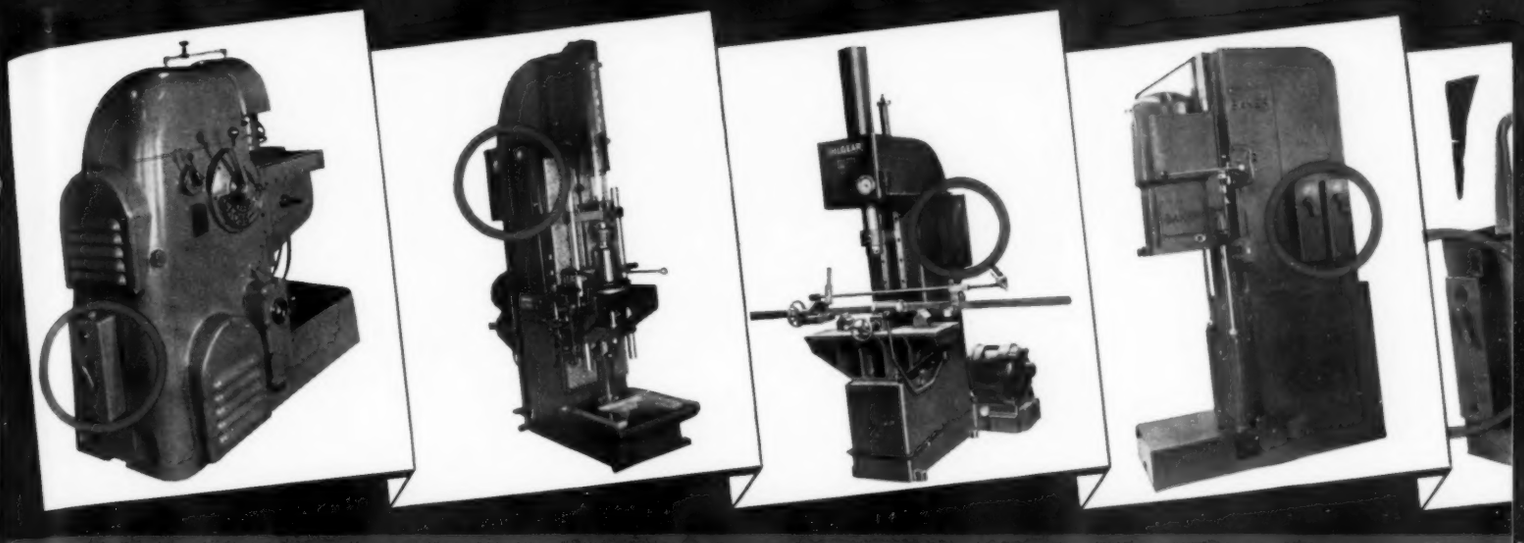
SPHEROIDIZING—To develop the best properties of carbon and carbon-vanadium steels having more than .90 per cent carbon, they should be completely spheroidized prior to hardening.

Spheroidizing is accomplished by annealing at temperatures of approximately 1400 deg. F. To promote greater uniformity, spheroidizing may be carried out by quenching in oil from between 1550 to 1600 deg. F., or by normalizing (air cooling) from between 1600 to 1700 deg. F. After the steel has cooled, either operation is followed by annealing at about 1400 deg. F. Holding time at annealing temperature must be sufficiently long, and the cooling rate sufficiently slow, to produce the desired spheroidized structure in the tool steel.

The above information is available on durable cards suitable for hanging in office or shop. Get your free supply by writing to Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY



TYPICAL INSTALLATIONS OF ALLEN-BRADLEY BULLETIN 712 COMBINATION STARTERS ON MACHINE TOOLS

How to Save critical materials *in your motor starter installations*

The easiest and quickest way to save critical materials is to simplify your control installations. For example—don't use a motor starter and a separate disconnect switch when you can buy both in one cabinet. Here are the advantages of A-B Combination Starters:

SAVE WIRING—You eliminate the wiring and labor of connecting two separate units—starter and disconnect unit.

SAVE CONDUIT AND FITTINGS—You do away with the conduit, lock nuts, bushings, and other fittings required to hook up two boxes.

SAVE METAL BOXES—You dispense with one box (disconnect unit cabinets are usually large and bulky) and thereby save steel.

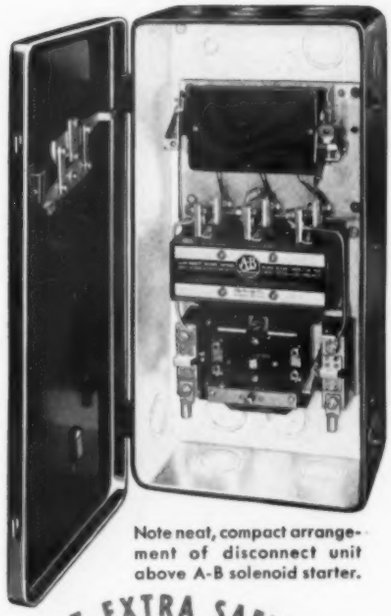
SAVE INSTALLATION TIME—You put up one cabinet—not two. That means less installation time and labor.

SAVE SPACE—You get a neater, more compact job with only one cabinet on the machine. See pictures above.

SAVE MAINTENANCE—Allen-Bradley solenoid starters and disconnect switches require no maintenance. The A-B patented silver alloy contacts in both units need no dressing or cleaning. There is only one moving part . . . no pins, pivots, bearings, or jumpers to cause trouble.

For full information, write for Bulletin 712.

Allen-Bradley Company, 1310 S. Second St., Milwaukee, Wis.



Note neat, compact arrangement of disconnect unit above A-B solenoid starter.

—AND GET EXTRA SAFETY, TOO!

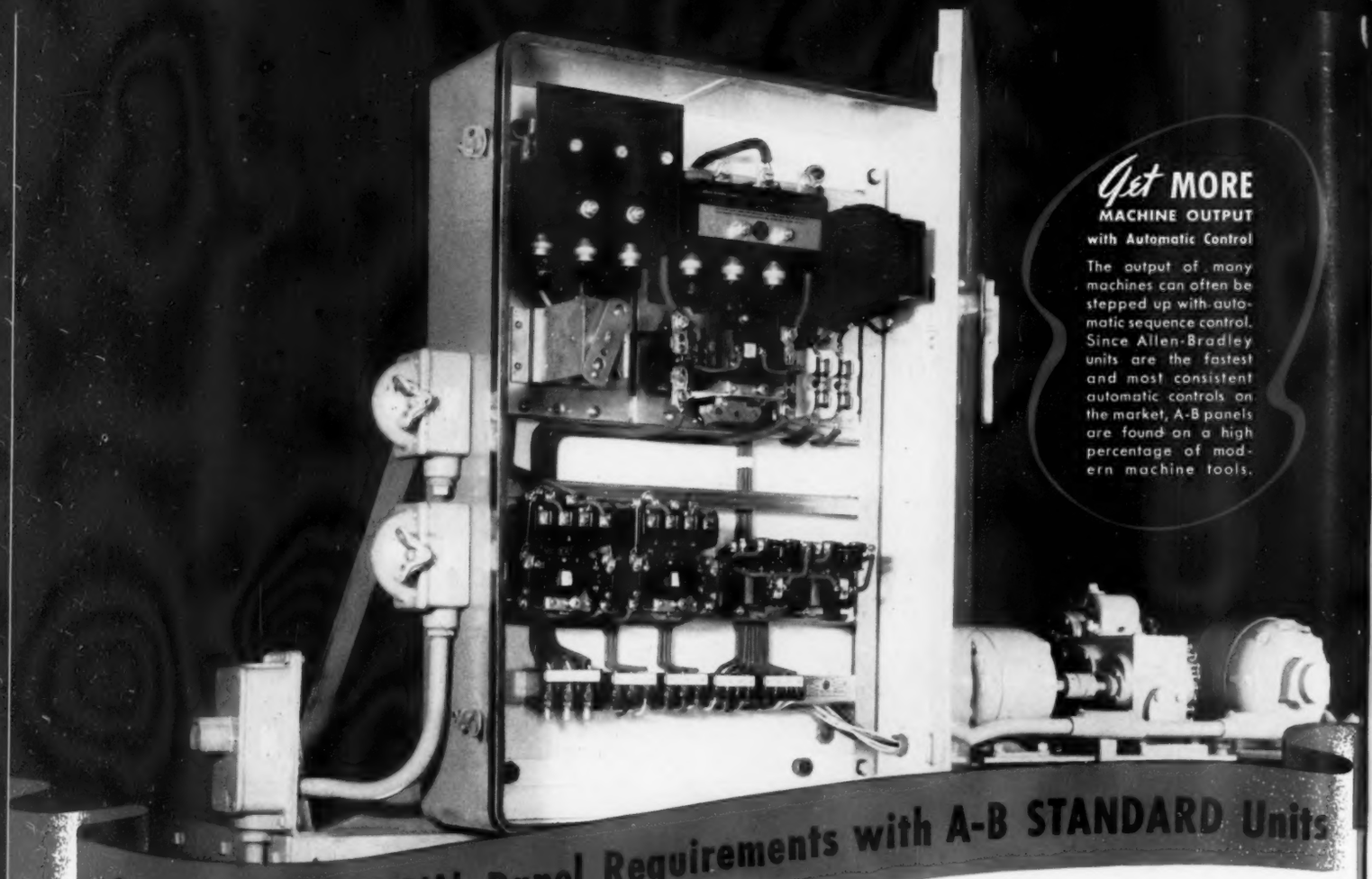
Cabinet cannot be opened unless disconnect lever is in OFF position. Switch can be padlocked by several maintenance crews to prevent reclosing before all of their jobs are completed.

A-B Quality

ALLEN-BRADLEY

COMBINATION STARTERS

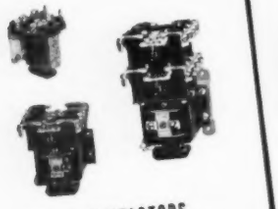
QUALITY



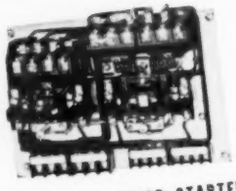
Get MORE MACHINE OUTPUT with Automatic Control

The output of many machines can often be stepped up with automatic sequence control. Since Allen-Bradley units are the fastest and most consistent automatic controls on the market, A-B panels are found on a high percentage of modern machine tools.

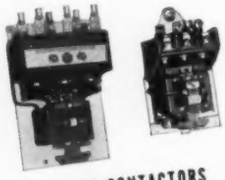
Satisfy Your SPECIAL Panel Requirements with A-B STANDARD Units



SMALL CONTACTORS

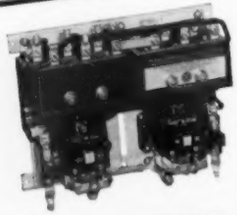


MULTI-SPEED MOTOR STARTERS

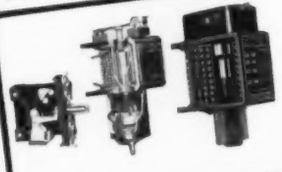


LARGE CONTACTORS

SQUIRREL CAGE MOTOR STARTERS



REVERSING SWITCHES



OVERLOAD and TIMING RELAYS

If your machines perform a definite sequence of operations, you can probably save critical materials by combining your control units on one control panel.

Special control panels need not mean special control units because Allen-Bradley engineers are constantly assembling intricate special panels using only standard units listed in the Allen-Bradley catalog.

The A-B line consists of such a wide assortment of contactors, relays, switches, disconnects, and starting units of all sizes and types that it is a simple matter to develop complex control panels entirely of time-tested, reliable A-B units.

Don't risk the dependability of your machines by using "trick" control panels. Standardize on A-B panels. Then you will be safe . . . and save critical materials, too.

ALLEN-BRADLEY

AUTOMATIC MOTOR CONTROL

QUALITY

SHIPS! GIVE US SHIPS!

Help Speed Up Production with U. S. Office of Education

MOTION PICTURES *that help to teach* SHIPBUILDING!

The production job has just begun! We've got to surpass all records—surpass all our own estimates if the job's going to be done! You're going to have to keep training new workers up to the day of victory! That's why you should put the U. S. OFFICE OF EDUCATION's great teaching aids to work for you now!

These ten great films are accurate and authentic. They are *proved* teaching aids! They are being used in shipyards all over the country! They are being used by the U. S. Government and its allies! They are being used by leading vocational schools! Time is precious! Use these films now!

LOW COST!—To give them the widest possible use. All available in 16 mm. Sound-On-Film.

FREE! Catalogue describing each film in detail. Also pamphlet, "TIME IS SHORT," telling how these motion pictures are producing results in boosting production. Send coupon today!

10 SUBJECTS

All Available in 16 mm. Sound-On-Film

LOW COST!

1. Preparing and Setting a Keel Block and Bottom Cradle
2. Inner Bottom Section:
   Sub-assembly of a Closed Floor
   Sub-assembly of a Solid Floor
3. Inner Bottom Section: Setting Up and Fitting Floor
4. Deck Girder: Sub-assembly
5. Side Frame: Sub-assembly of a Web Frame
6. Girders: Setting Transverse Web Frame and a Horning Girder
7. Bulkhead: Laying Off the Boundary and Stiffeners on a Transverse
8. Bulkhead: Laying Off and Fitting a Center Line Stiffener
9. Bulkhead: Setting a Transverse, Water-Tight Bulkhead and Hull
10. Deck Plates: Regulating and Setting

ALSO 38 FILMS ON MACHINE SHOP WORK!

Accurate! Authentic! Great teaching aids used by industries, vocational schools, our armed forces, and by our Allies!

CASTLE FILMS INC.

DISTRIBUTOR FOR

THE UNITED STATES OFFICE OF EDUCATION

CASTLE FILMS, INC.

RCA BLDG. NEW YORK | FIELD BLDG. CHICAGO | RUSS BLDG. SAN FRANCISCO — Address nearest office

Send FREE Catalogue describing all U. S. OFFICE OF EDUCATION MOTION PICTURES on SHIPBUILDING. Also pamphlet, "TIME IS SHORT."

*Name*_____

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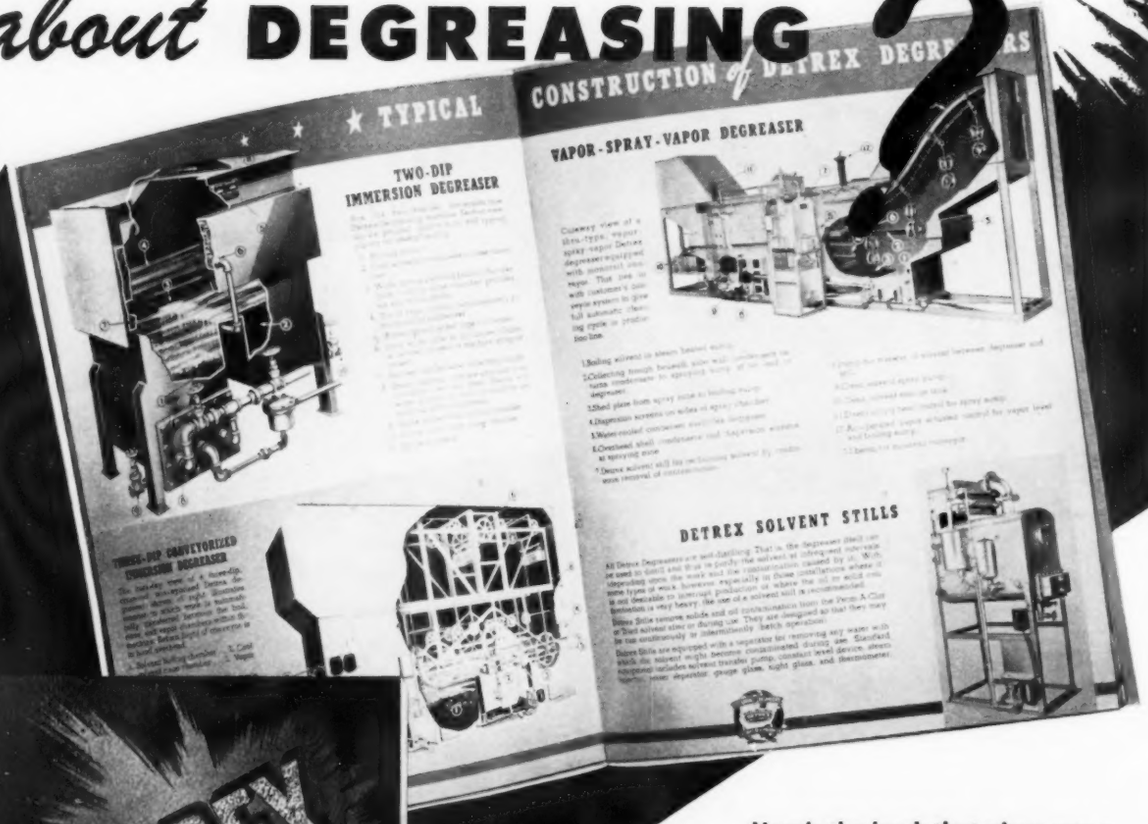
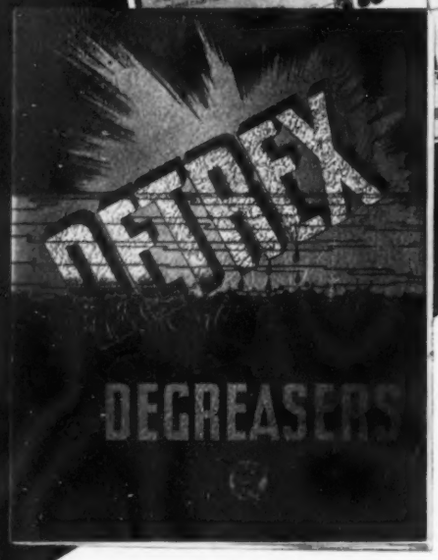
What do **YOU** *want to know about* **DEGREASING**?





Here's the book that gives you a full understanding of modern degreasing methods . . . and the *complete* story of Detrex Degreasing.

In its 24 pages, you will find a comprehensive description of the theory of degreasing . . . the design and construction of degreasing machines . . . the solvents which are used. Special emphasis is placed on Detrex Degreasers now being used in armament production. Pictured and described are a number of degreasers designed with various types of conveying systems.

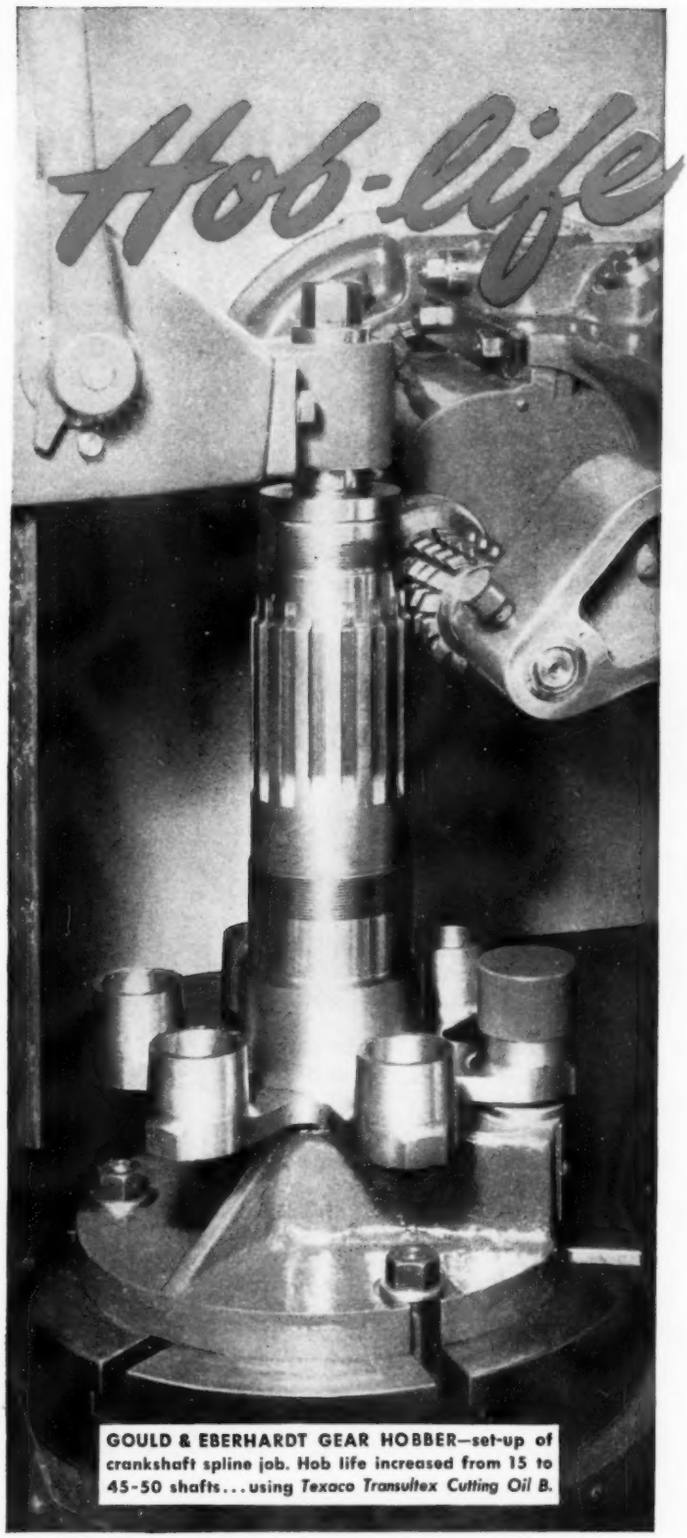
This new book may be had by writing for it on your company letterhead.

CLEANING ENGINEERS
DETREX
DETROIT REX PRODUCTS

DETROIT REX PRODUCTS COMPANY

13023 HILLVIEW AVENUE • DETROIT, MICHIGAN

Branch Offices In Principal Cities of U. S. A.— In Canada: Canadian Hanson & Van Winkle Co., Ltd., Toronto, Ontario



GOULD & EBERHARDT GEAR HOBBER—set-up of crankshaft spline job. Hob life increased from 15 to 45-50 shafts... using *Texaco Transultex Cutting Oil B.*

TRIPLED!

WHEN hobbing the splines on aircraft engine crankshafts, the best output reached by a prominent manufacturer was 15 shafts between tool grinds.

Changing to *Texaco Transultex Cutting Oil B,* output per hob grind promptly went up to between 45 and 50 shafts.

Additional reasons for Transultex superiority are:

transparency
freer cutting
better surface finish
heat dissipation

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent users in the metal-cutting field.

Texaco users enjoy many benefits that can also be yours. A Texaco Engineer specializing in cutting coolants will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS

TEXACO REG T.M.

TEXACO Cutting and Soluble Oils
FOR THE METAL-WORKING INDUSTRY

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

This is the growth of the

It is likewise an excellent forecast of the promise this great undeveloped medium of transportation offers to American Industry

THAT little circle at the left above represents the value of products manufactured by the aviation industry in 1939—$250,000,000.

In 1943 that volume will have increased 36 times over to the staggering figure of $9,000,000,000.

The sheer statistics of aviation's growth tax the imagination. An industry employing a relative handful of men in 1939, aviation will next year keep a million and a half workers busy. Even in its high-production years our giant peacetime automotive industry employed but one-third that many.

But the war has done more than bring us this huge market of today.

War has shown us that we've just scratched the surface possibilities of the airplane's utility. Yes, we've used it to carry perishable and rush products by air express. Air mail and air travel have grown steadily, though many still regard them as luxuries. But the big payload—*freight*—still went by train, by truck and by boat at the beginning of the war.

Now we are beginning to see the clear outlines of air transport taking shape in its ultimate form. Huge airliners will be able to carry first-class mail *at no increase in rates* and air cargo-carriers will handle freight-car loads *at freight-car rates,* time considered.

The possibilities of air transport are limited only by our imagination and resourcefulness in using this remarkably flexible method of transportation.

Aviation Industry in 5 short years . . .

Obviously the time to establish your position in this coming field of commercial opportunity is now.

The method of sales communication has long since been well established.

26 years ago a magazine called *Aviation* and *Aeronautical Engineering* hung out its publishing shingle. It traveled with the industry through its long years of pioneering and experimentation, its successes and its failures.

For the men who guided and built the aeronautical industry *Aviation* has been since 1916 the effective vehicle of communication.

Today the serious-purposed men of the industry depend on the authoritative editorial pages of *Aviation* to bring them the up-to-the-minute information on production, design and engineering advancements, the significant developments in military and civil aviation both here and abroad, the news of the industry *in proper perspective.*

The men who are building our air power today and who will build our air commerce tomorrow, look to *Aviation* as a feet-on-the-ground aeronautical industry publication—sans romance or glamor.

Aviation is edited for and read by the influential men of the industry, the men who can say yes-or-no, the only group you are interested in reaching through your advertising.

Here are just two of many examples of *Aviation's* editorial influence among the men who are the buying power of the industry . . .

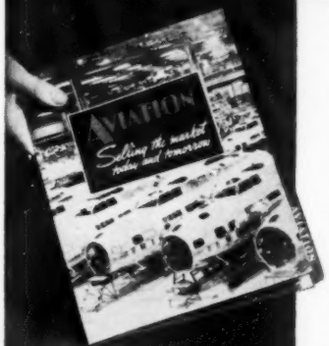
Example I—When *Aviation's* editors recently uncovered the story of a revolutionary new method of forming metal sheets in huge sizes, a flood of mail poured in from busy engineers and production men . . ."Tell us more."

Example II—A recent letter-survey to top aeronautical manufacturing executives disclosed that better than 3 of every 4 not only read *Aviation* regularly but find it useful in their daily work. The letter went only to the highest ranking men in 100 aircraft, engine and propeller plants — presidents, chief engineers, general managers, production managers, purchasing agents, etc., *no one below the rank of department head.*

Aviation aims its editorial content, its circulation effort at the buying power of the industry—not the armies of workers and flying fans.

That is why *Aviation* today leads all other aeronautical publications in advertising gains.

AVIATION'S LATEST MARKET FACTS . . . just off the press



This 72-page booklet, an invaluable file of Aviation Market and Media Information is now available to you. Designed for sales-planners, it's a comprehensive picture of the market today and tomorrow. Complete editorial, circulation and advertising information on AVIATION. A request on your business letterhead will bring your copy promptly.

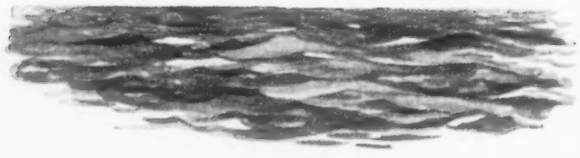
Address Market Service Dept. of Aviation

AVIATION

A McGraw-Hill Publication • 336 West 42nd Street, New York, N. Y.

OFFICES IN CLEVELAND, DETROIT, CHICAGO, BOSTON, PHILADELPHIA, WASHINGTON, ST. LOUIS, ATLANTA, LOS ANGELES, AND SAN FRANCISCO.

DOW



TRADE DOWMETAL MARK

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

THE SUCCESS of Dow technicians in extracting magnesium from sea water came at the very time when it was most needed for fighting aircraft and other weapons for our armed forces. But the ultimate wider applications of this extraordinary weight-saving metal carry far-reaching social implications. Industrial designers will see endless possibilities for usefulness in the vast quantities of magnesium to be available when Victory is won. Out of their imaginations will come applications affecting every phase of American life.

MAGNESIUM

The Lightest Structural Metal . . . One-third Lighter Than Any Other in Common Use

GIVE US MORE TANKS!

That is where welding came into its own—for precious hours on the assembly line then could be saved—to produce more tanks with the same number of men on the same line.

And that is where the new welding electrode developed exclusively by PAGE for welding armor plate went to work—after it had met successfully all ballistic tests on plates submitted to the Army Ordnance Department by the tank manufacturers.

Chalk that up as another important contribution by PAGE that will be at the service of industry when Victory brings peace.

PAGE STEEL AND WIRE DIVISION

Monessen, Pa., Atlanta, Chicago, New York, Pittsburgh, San Francisco

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, INC. BRIDGEPORT, CONNECTICUT

IS CHROMIUM PLATING YOUR ANSWER TO EXTENDING THE LIFE OF VALUABLE TOOLS AND EQUIPMENT?

GAUGES *for example*–

CHROMIUM PLATING may reclaim them– give them longer, more accurate life!

This booklet describes many applications ➡

NO WORN GAUGES should be scrapped today without first determining whether or not they can be reclaimed, simply by chromium plating the gauging surfaces slightly oversize and then finishing to the correct dimensions. Your present stock of gauges thus treated can be made to last indefinitely, for chromium plating will bring them back to size over and over again.

In addition, performance of these gauges shows a marked increase in life—in some cases as much as seven or eight times that of unplated gauges. Extreme hardness and abrasion-resistance of chromium is the answer. Also the non-galling property eliminates seizing. And the exceedingly fine polish obtainable permits gauges to be finished to a desired size or shape without any of the defects usually present in a burnished surface.

FOR MANY OTHER TOOLS AND PARTS

This is just one of countless ways in which chromium plating saves valuable man-hours and materials for war production . . . by extending the life of a wide variety of parts subject to wear and corrosion . . . by reclaiming many hard-to-replace machine tools and parts which have been worn or machined off-size and would otherwise have to be scrapped. Successful application of chromium plating for both new equipment and salvage include:—ball and roller bearing parts, drive shafts, axles, pistons, cylinders, cylinder liners, rollers, mixing, grinding and drying machinery parts, as well as many types of taps, dies, reamers, jigs and fixtures.

The helpful booklet shown above describes these applications in detail. It may assist you in meeting some of today's most urgent production and maintenance problems. A copy of *"The Last Thousandth of an Inch that Speeds Production"* is yours for the asking. In writing please mention *The American Machinist.*

UNITED CHROMIUM

INCORPORATED

51 East 42nd Street, New York, N. Y.

Waterbury, Conn. ☆ **Detroit, Mich.**

In shipyards, too

COMPETITION FORCES OUR HAND

Everywhere you look in shipyards today, it's weld, weld, weld. Why the sudden, complete change to arc welding?

ALTER EGO: *Competition!* We were competing with enemy subs and bombers and they *forced* us to build good ships *faster*. We were *forced* to change to arc welding to beat the Axis competition.

Arc welding IS building ships faster, all right—more than twice as fast as the old method . . . just as it's speeding construction of tanks, planes and guns—making them better, too.

ALTER EGO: So look out now for the post-war Battle for Business. Competition will again force change to arc welding to produce better and cheaper autos, home appliances, houses, bridges and other products. We can be forced to change or we can be ready.

Let's put our designs on the alert now with arc welding so we'll get a head start on our competitors.

Ask *your* inner self if competition doesn't force *your* hand.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

FEATURES OF DODGE V-BELT DRIVES

1. Matched quality sheaves and V-belts give team performance.
2. Sheaves made of close grained iron insure smooth grooves.
3. Accurately machined grooves provide proper belt seating.
4. "D-V" Belts have concave side walls which prevent bulging over sheaves.
5. D-V belts are cured under tensions require no adjustment.

BOMBS, shells and other munitions, months in the making, may be expended in minutes. Every production machine has a vital and unending responsibility — Dodge power transmission appliances on your products assure *all* power in the job turning them for Victory.

Dodge-V-belt drives are delivering full power to millions of machines on round-the-clock schedules in the Victory production drive. More horsepower becomes battle power with Dodge efficiency and ruggedness providing safe, continuous passage for power.

Dodge V-belt drives are complete, modern power transmitting units. Sheaves and V-belts are of matched quality, assuring proper belt seating, saving wear and power — extending the life of drives and hard pressed motors. Sheaves are carefully machined—groove dimensions are uniform, each matching V-belt carries its share of the load. They maintain constant speed ratios at all speeds. No lubrication is required, eliminating any danger of oil damage to products.

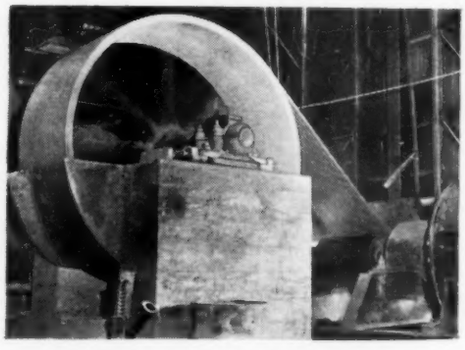
Put *all* power in the job by installing Dodge V-belt drives on your equipment.

Dodge Distributors specializing in "The Right Drive for Every Job" provide industry with a source of supply from local stocks, including alternate selections.

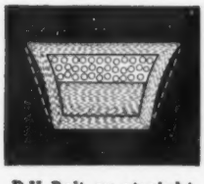
DODGE MANUFACTURING CORPORATION, *Mishawaka, Indiana, U.S.A.*

How to Make V-Belts Last Longer

Driving sheave and driven sheave should be in exact alignment. This saves wear — prevents power waste . . . Slack off tension when mounting belts on sheave. Don't force them . . . It is wasteful to put new belts on excessively worn sheaves. Roughness shortens life of belts . . . If it is necessary to replace one or more belts on a drive, replace them all . . . Mount belts evenly so that belt tension is uniform . . . Don't overload — Dodge engineering and Dodge equipment assures "The Right Drive for Every Job."

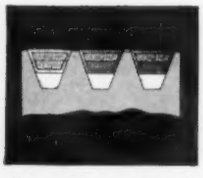


A 300 HP. Dodge "D-V" Drive on Tube Mill Drive in Cement Mill. Important advantages are high ratio speed reduction — ability to absorb shock — substantial power savings.

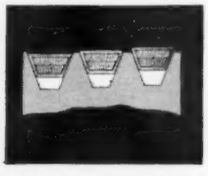


D-V Belt on straight run shows concave side walls. Latex impregnation insures against cord separation.

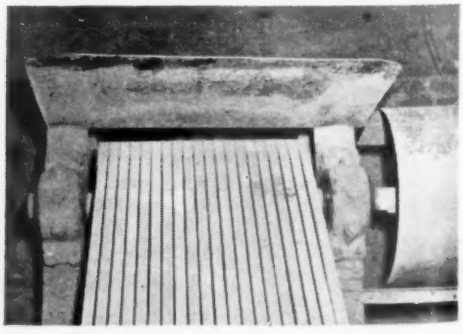
D-V Belt around sheave shows how concave side walls expand on flexing over sheave.



Accurately machined sheave grooves, match V-Belts dimension — give even pull on all belts.



When sheave grooves are not uniform, power loss and excessive wear results.



This 200 HP. Dodge "D-V" Drive has been in operation for several years on a twenty-four hour a day schedule in a smelter. Dodge-Timken Type "C" Pillow Blocks, with triple steel seals, keep out dirt and retain lubricant. This prevents oil damage to belts.

DODGE
MISHAWAKA

THE RIGHT DRIVE FOR EVERY JOB

THROW ALL YOUR SCRAP INTO THE SCRAP

PUT *ALL* YOUR POWER IN THE JOB

There's a SC Gas-Fired

STANDARD RATED FURNACE

FOR PRACTICALLY EVERY INDUSTRIAL HEAT TREATING NEED

MANY TYPES AND SIZES MEET MOST ANY PRODUCTION DEMAND

● It's quick and easy to select the proper SC Standard Rated Furnace for the desired production, and to determine in advance the cost for every heating operation. All this is possible because Surface Combustion has available 34 different types of Standard Rated Furnaces, each built to standard, thoroughly tested specifications and rated on the basis of actual performance characteristics taken from the engineering records of thousands of installations in operation throughout the entire metal working industry.

All preliminary engineering for SC Standard Rated Furnaces is completed, designs have been drawn, parts are in stock and shipment can be made in short time.

Now, when more and faster production is at a premium, SC Standard Rated Furnaces are meeting the demand with economy and efficiency. Why not state your heating or heat treating problem? We'll mail literature and specifications on the proper equipment to meet the need for stepping-up war production.

SURFACE COMBUSTION . . . TOLEDO, OHIO

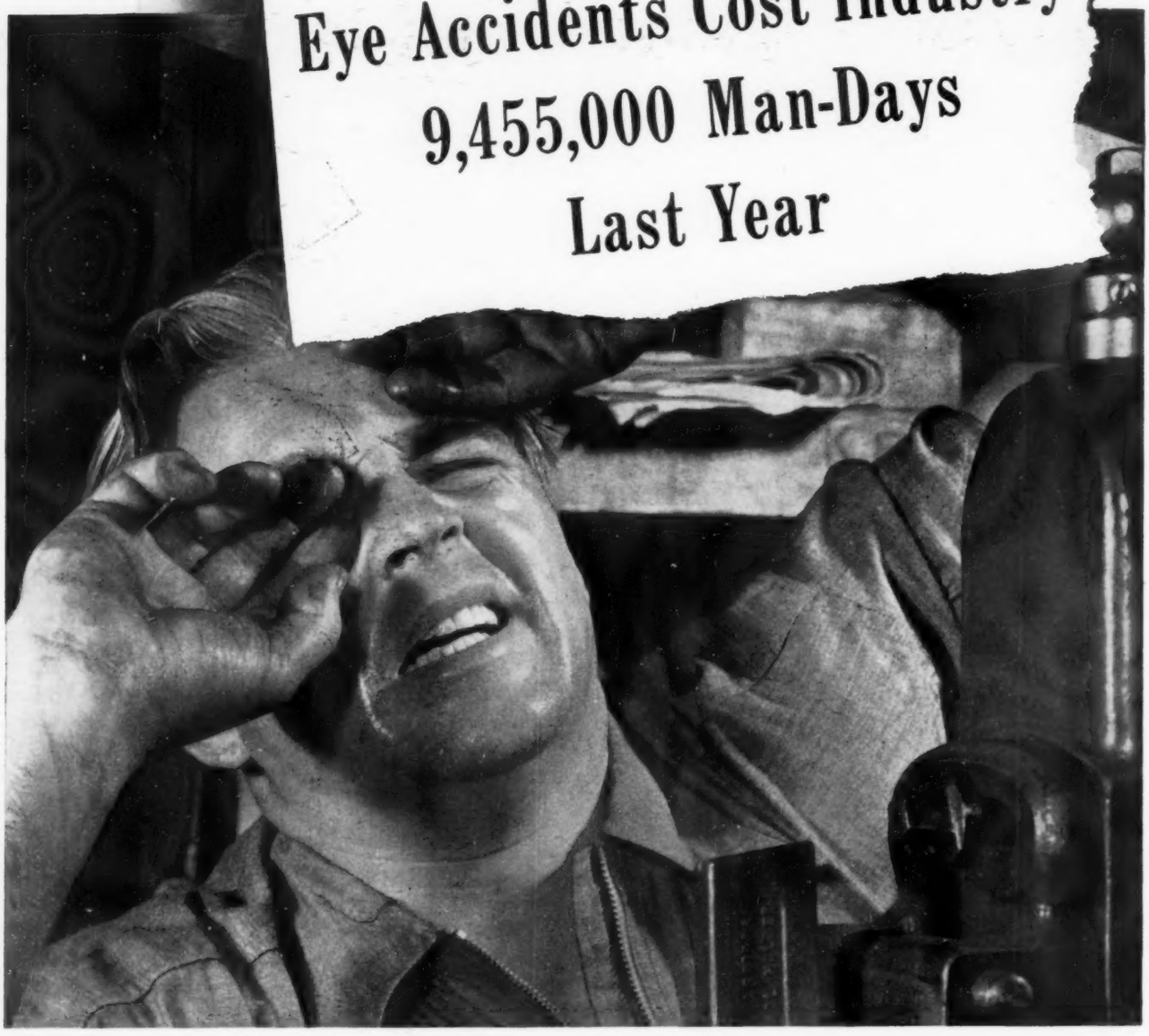
SC

SURFACE COMBUSTION

MANUFACTURERS OF INDUSTRIAL FURNACES · JANITROL GAS-FIRED SPACE HEATING EQUIPMENT · AND KATHABAR AIR CONDITIONING SYSTEMS

THIS IS NO MILITARY SECRET

Eye Accidents Cost Industry 9,455,000 Man-Days Last Year



The tremendous number of eye accidents that are slowing up our vital war production are also robbing America of the invaluable services of much skilled labor.

American Optical Company offers the means of minimizing eye injuries—a complete line of protective, comfortable goggles, for every type of industrial eye hazard. More than this, AO trained Safety Engineers will gladly work with *your* Safety Director in every possible way toward installing and maintaining the most effective and economical eye protection program for your plant.

Get in touch with your nearest American Optical Company Branch Office as soon as possible.

American Optical

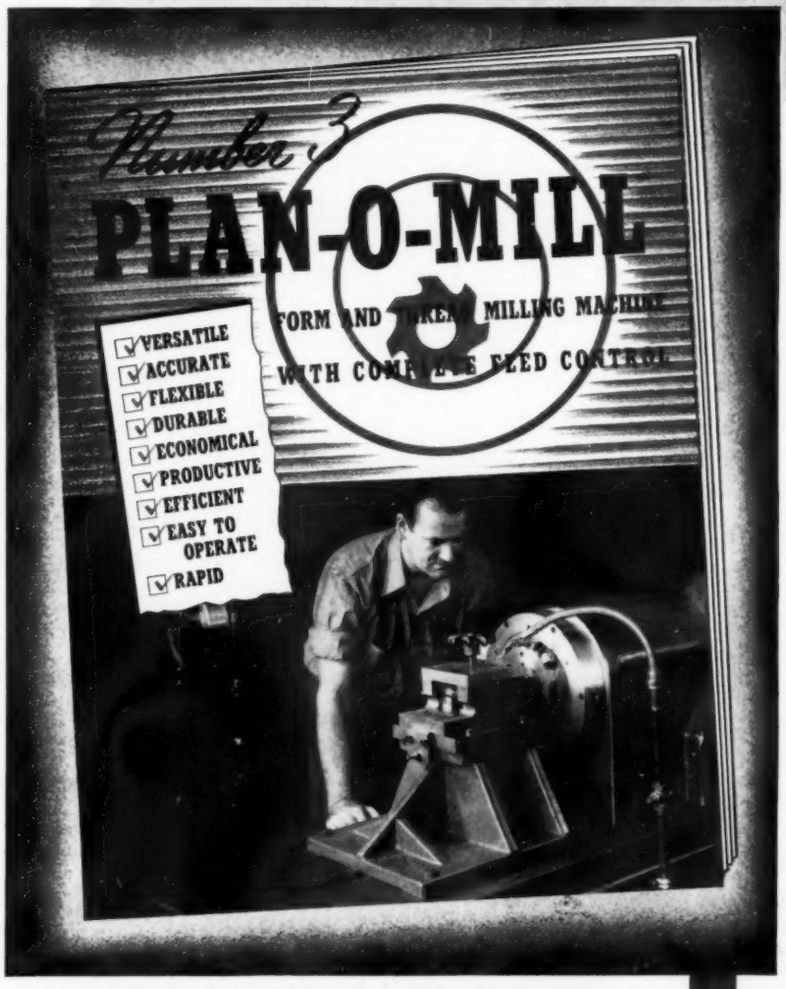
COMPANY

SOUTHBRIDGE, MASSACHUSETTS

1082

HOW CAN YOU IMPROVE PRODUCTION OF THREADS AND CYLINDRICAL FORMS?

—YOU'LL FIND THE ANSWER IN THIS BOOK!



IF you have any job that involves external or internal threading, or cylindrical forming, this book may show you how Plan-O-Mill can do it faster, with equal or greater accuracy!

Generously illustrated, this new catalog clearly describes Plan-O-Mill's remarkable milling principle . . . shows how it can go profitably to work for you. Floor-to-floor time cut 88 percent! Indicating eliminated! Push-button ease of operation! These are only a few of the Plan-O-Mill achievements enumerated.

Call or write your local Plan-O-Mill distributor (listed at left) for your copy. PLAN-O-MILL CORPORATION, Washington Square Building, Royal Oak, Michigan.

PLAN-O-MILL

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TURCO

Vital

IN WAR OR PEACE

Regardless of whether our nation is at war or peace, the Specialized Industrial Chemical Compounds of Turco Products, Inc. are vital to Industry. In preparation for Anodizing or Chromatizing; for Phosphatizing; for spotwelding and weld masking; for degreasing and decarbonizing of machine parts; for removal and prevention of corrosion; for almost every operation in the plant, there is a Turco compound for production and maintenance.

Ask us for technical information. Call in your local Turco Specialist for free consultation. Want ideas and production short cuts? Check and mail the coupon below. No obligation.

MAIL THIS COUPON

TURCO PRODUCTS, INC. 1-112
6135 S. Central Ave., Los Angeles
Please send FREE literature on materials, methods and procedure pertaining to the operations checked below:

NAME_____ TITLE_____

FIRM_____

ADDRESS_____ STATE_____

I'M INTERESTED IN THE OPERATIONS WHICH I HAVE CHECKED (✓):

- ☐ Acid Pickling
- ☐ Aluminum Spot Welding
- ☐ Anodizing
- ☐ Cadmium Plating
- ☐ Chemical Vapor Cleaning
- ☐ Chromatizing
- ☐ Cleaning Metals Before Processing
- ☐ Cleaning Prior to Plating
- ☐ Cold Immersion Cleaning
- ☐ Cold Spray Cleaning
- ☐ Floor Maintenance
- ☐ Glass Cleaning
- ☐ General Plant Maintenance
- ☐ Hot Immersion Cleaning
- ☐ Magnesium Processing
- ☐ Paint Camouflage Cleaning
- ☐ Paint Department Maintenance
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- ☐ Phosphatizing
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- ☐ Stainless Steel Processing
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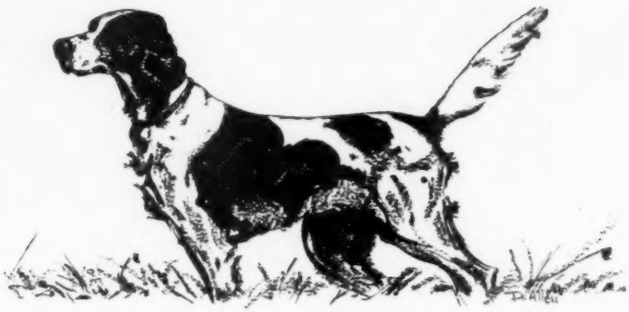
A POINT TO CONSIDER . .



DUST CONTROL IN YOUR PLANT

TODAY, more than ever, "dust control" is recognized as an important necessity to industry.

"All out" war production must not be impaired by machine breakdowns or lost man hours.

Torit self-contained, portable Dust Collectors will solve your dust problems, simply, efficiently and economically.

Write today for bulletin giving Torit features, specifications, prices, or give us your "dust problem" and let us recommend a solution without obligation.

TORIT MANUFACTURING CO.
280 Walnut St.
St. Paul, Minnesota

Traps dust from grinding and buffing wheels instantly.

TORIT Dust Collectors
SELF-CONTAINED UNITS

When You Order HACK SAW BLADES Specify

"Made of INGERSOLL *D-B-L"

(TUNGSTEN .....5.00—6.00
MOLYBDENUM...4.00—5.00)

* Produced by Ingersoll for the past 4 years under an exclusive license arrangement with Allegheny-Ludlum Steel Corporation.

That's the Way You Can Be Sure of Getting D-B-L backed by 4 Years' Manufacturing Experience

Ingersoll D-B-L is the lower cost type of High Speed Steel that has so successfully solved the Hack Saw Blade problem for America's record wartime production.

Four years ago, Ingersoll began to produce D-B-L Steel for Hack Saw Blades. So successful was this product that many Hack Saw Blade users adopted it long before wartime restrictions curtailed the use of vital alloys.

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite. Specify *Ingersoll* D-B-L, on its 4-year record of past performance.

INGERSOLL STEEL & DISC DIVISION
BORG-WARNER CORPORATION
New Castle, Indiana
Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

Other Special INGERSOLL Sheet Steels include:

Alloy Steels
Armor Plate
Clutch Plate Steels
Tillage Steels
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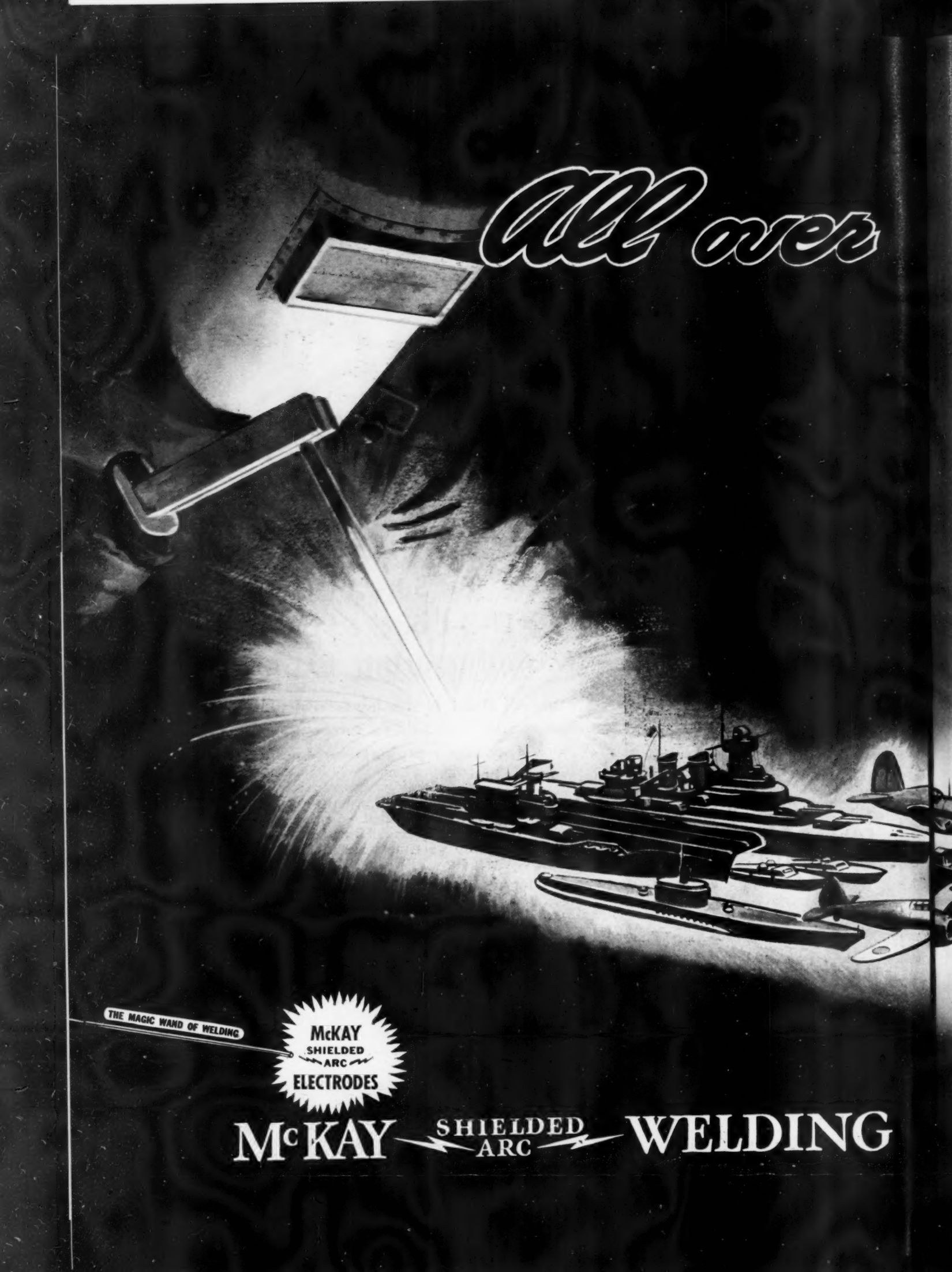
Shovel Steels
Knife Steels
TEM-CROSS Steel
IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

INGERSOLL STEELS

FOR SPECIAL USES


All over
THE MAGIC WAND OF WELDING
McKAY
SHIELDED
ARC
ELECTRODES
McKAY SHIELDED ARC WELDING

America ...

McKAY ELECTRODES ARE PROVED IN ACTION!

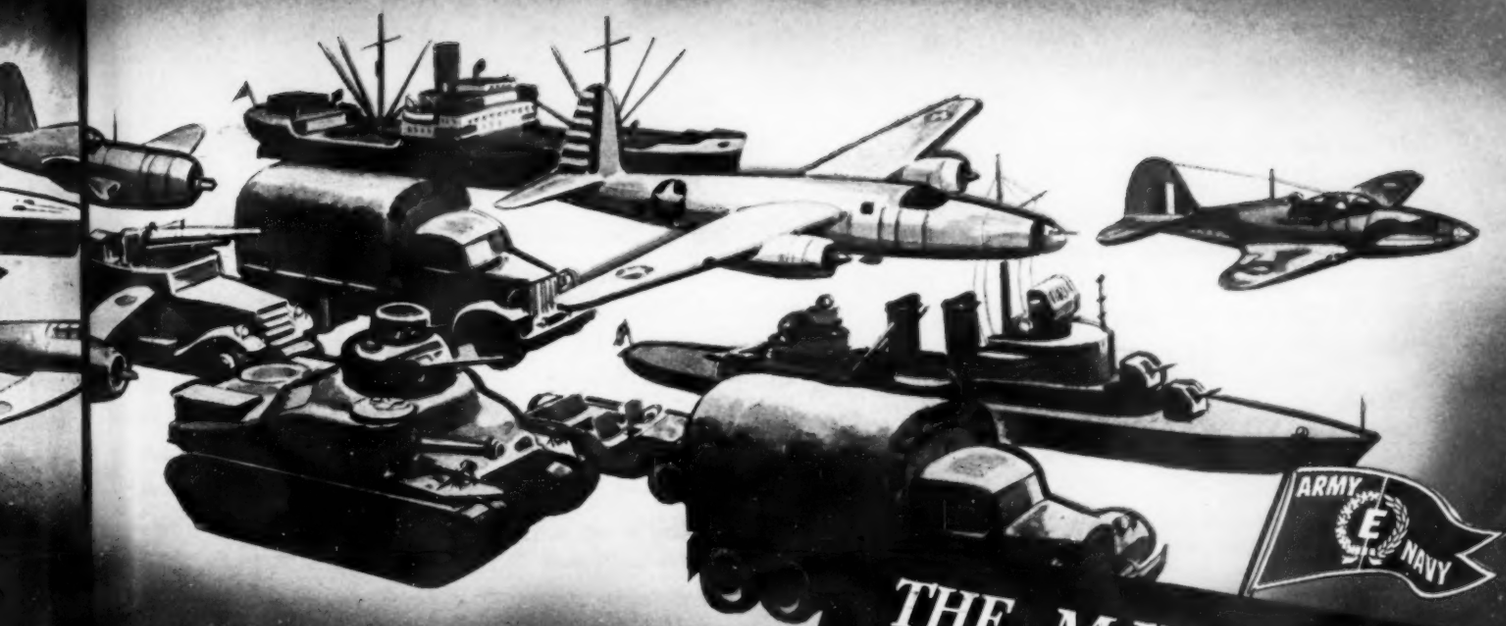
America's "Arsenal of Democracy" pours forth an endless stream of fighting equipment . . . *much* of it welded with McKAY Shielded-Arc ELECTRODES.

In intense, continuous action of the *production* line these Electrodes *prove*, day after day, the promised superiority of the McKAY "*researched* line!"

For McKAY ELECTRODES are not just the products of evolutionary experience. They are the result of deliberate development by technicians from a great scientific institute, to create *a whole* electrode line *each type* of which should be *equal* or *superior* to any available.

How well this objective has been attained is attested by the fact that the entire output of McKAY carbon steel, stainless and alloy steel electrodes is speeding war production in vital industries all over America.

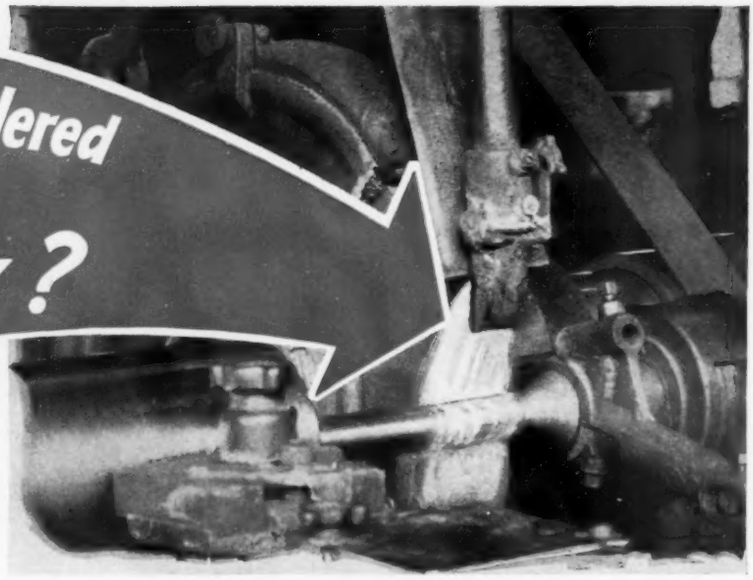
Literature and information, about the line in which *every* electrode is a "researched" leader, is available on request.



ELECTRODES

THE McKAY CO.
PITTSBURGH, PENNSYLVANIA
Welding Electrodes - Industrial Chain - Tire Chains

Have You Considered This THIRD POSSIBILITY?



The recent advertising message of a nationally known manufacturer of abrasive wheels featured this question in a typical production man's words, "HOW CAN I GET MORE GROUND PARTS WITHOUT MORE GRINDERS?" It was answered by suggesting that the reader try either one or both of two possible solutions:

FIRST POSSIBILITY: Change the Grinding Wheel.

SECOND POSSIBILITY: Change the Grinding Method.

To these constructive recommendations, we should like to add this:

THIRD POSSIBILITY: CHANGE TO OAKITE GRINDING COMPOUNDS!

Here are the reasons: As a coolant for wet grinding, the use of Oakite Grinding Compounds gives assurance of stability, maximum cooling and lubrication, resistance to rancidity, non-gumminess and rust prevention. Solutions have marked acid tolerance. They are long lasting.

These and other important characteristics of Oakite Grinding Compounds result in a free-cutting, clean wheel. There is less loading and glazing... far less need for wheel dressing. Experience clearly indicates you are assured of MORE PRECISION WORK and smoother, better finishes, with production STEPPED UP to rated capacity of grinders.

When making any changes in your grinding practices, take advantage of the experience of the grinding wheel manufacturer. Consult his field men or his local distributor's men . . . but don't stop there! Let the Oakite Technical Service Representative also give you the benefit of his personal help in selecting the correct Oakite Grinding Compound formula for the best results on your particular type of work.

IN THE MEANTIME . . .

may we send a FREE copy of this practical, informative 20-page manual, "OAKITE CUTTING AND GRINDING COMPOUNDS"? It's yours for the asking . . . won't you write today?

Manufactured only by

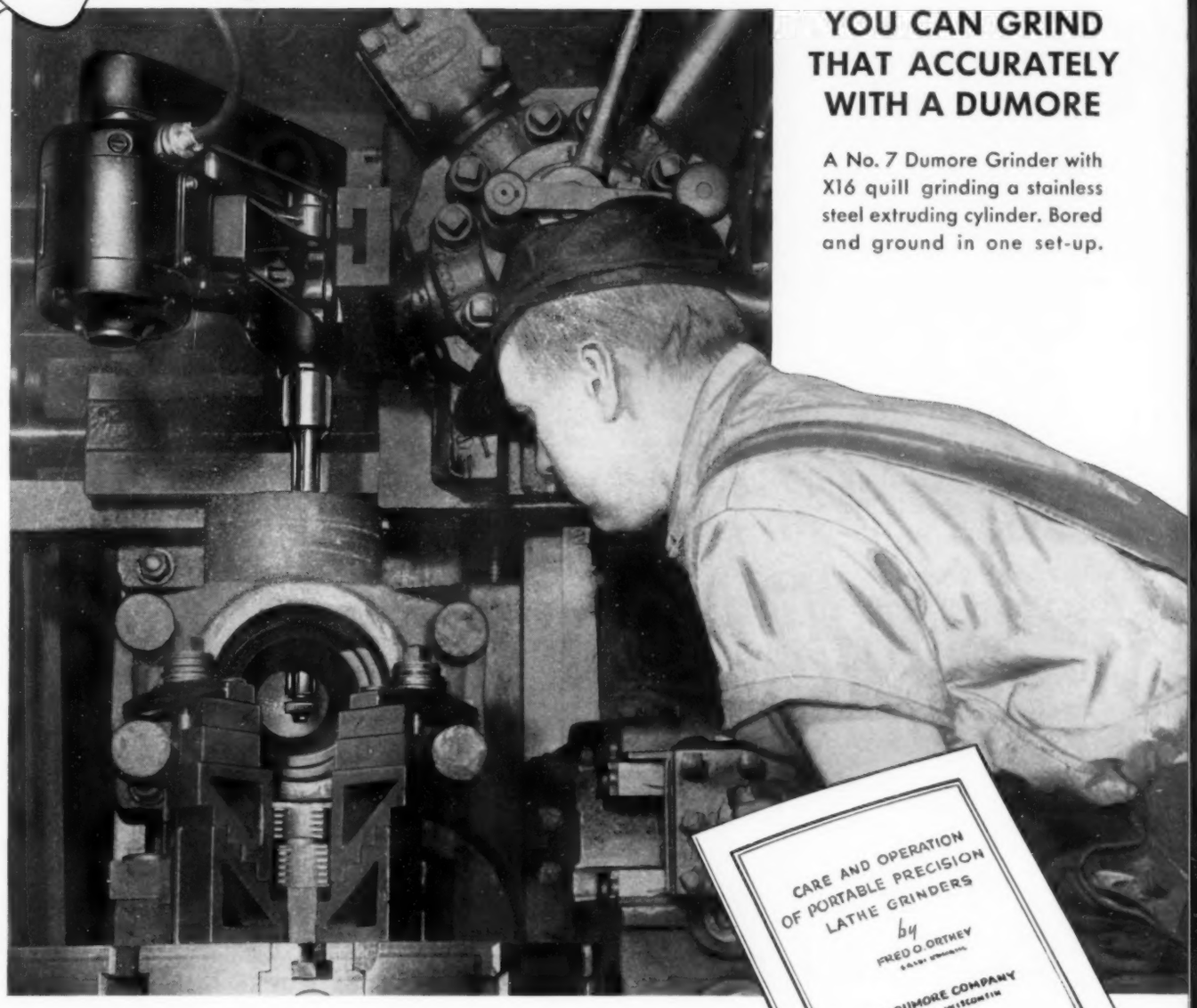
OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.

Representatives in All Principal Cities of the United States and Canada

OAKITE MATERIALS...METHODS...SERVICE

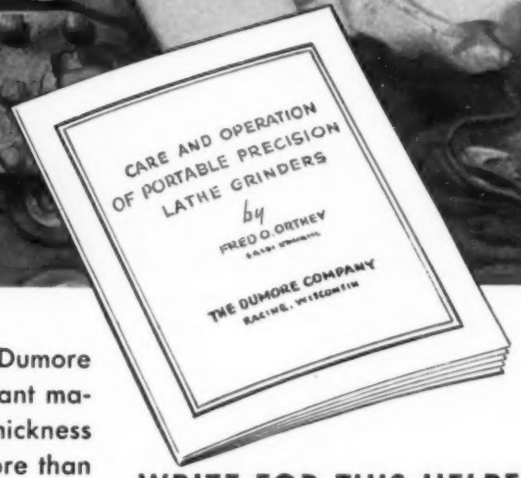
CLEANING FOR EVERY CLEANING REQUIREMENT

1/28 the thickness of a Human Hair



YOU CAN GRIND THAT ACCURATELY WITH A DUMORE

A No. 7 Dumore Grinder with X16 quill grinding a stainless steel extruding cylinder. Bored and ground in one set-up.



For superior military machines, and the tools it takes to make them, use Dumore Grinders on your lathes, planers, milling machines, and other important machine tools. When you can grind to .0001 of an inch...within 1/28 the thickness of a human hair...that's precision production. Dumore Grinders do more than that...they save man hours, material...even lives... by stepping up production schedules, reducing spoilage, turning out better work, more work in less time. Dumore Grinders also are noted for their versatility . . . they can be mounted in so many ways, so quickly, easily. What's more, they can handle a job from start to finish...from the first rough cut to the final finishing operation. Let Dumore engineers help you solve your war production problems, increase the productive capacity and efficiency of your present machines. . . . See a Dumore distributor or write.

Throw Your **SCRAP** into the **FIGHT**®

WRITE FOR THIS HELPFUL INSTRUCTION BOOK ON PRECISION GRINDING

Maintenance of tools is a vital wartime necessity. For this reason, the Dumore Company now offers this practical handbook FREE if requested on your company letterhead. Regularly priced at 25 cents.

THE DUMORE COMPANY 132-L Racine, Wisconsin

Dumore PRECISION Grinders

SYMBOL of VICTORY

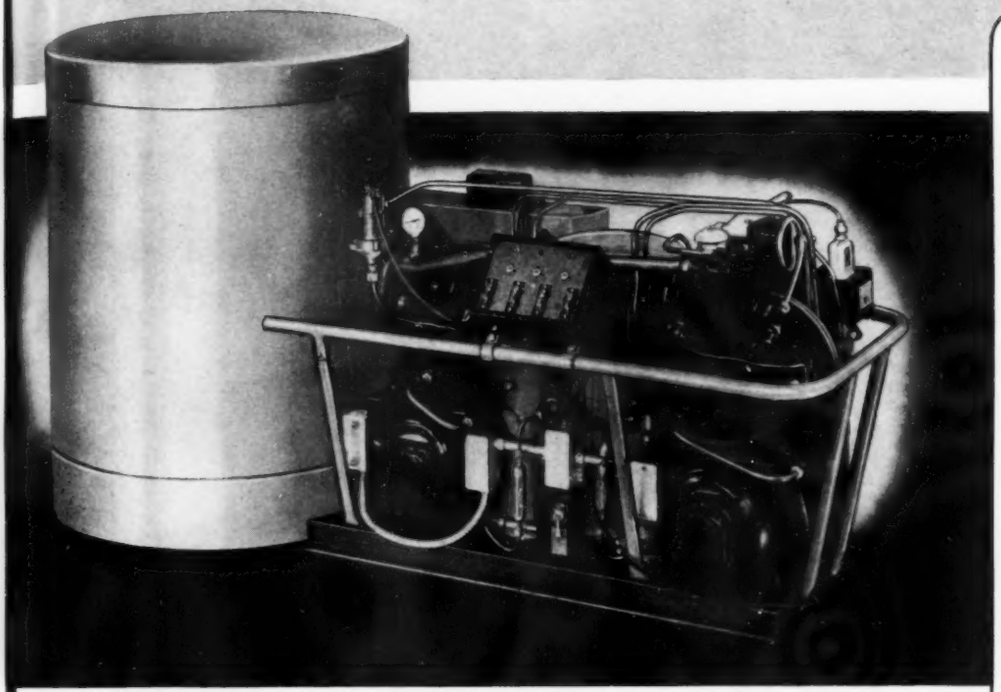
Planes and more planes, machines and more machines and back of them goes our symbol of victory. We at BAY STATE are proud of our trade mark. To us it reflects the power of production embodied in abrasive products. To us it shows our part in the gigantic world-wide battle of production.

With greatly expanded kiln and oven capacity, new modern presses, increased personnel, BAY STATE offers greater production, quicker delivery and more accurate grade control of all types of resinoid and vitrified bonded abrasive products. Wheels of Progress indeed!

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

How *Deepfreeze* Speeds the Shrinking, Testing *and Treating* of Metals . . . .



Removes 1000 B.T.U.'s per hour at −120° F.

In addition to eliminating the inconvenience of handling dry ice, the Deepfreeze *Cascade* Chilling Unit produces and maintains a temperature substantially 29° colder than dry ice.

Laboratory tests on high-speed steel reveal that this additional chilling capacity will produce "combinations of hardness, strength and ductility unobtainable by ordinary hardening and tempering. Temperatures colder than minus 150° Fahr. have no useful effect on high-speed steel, and may produce cracking in the metal. Temperatures *warmer* than minus 100° Fahr. are relatively ineffective." Therefore, temperatures ranging between minus 100° Fahr. and minus 150° Fahr. are ideal for the proper treatment of high-speed steel.

THE DEEPFREEZE CASCADE INDUSTRIAL CHILLING UNIT has a chill-chamber 24" in diameter x 30" deep. It is equipped with two motors and two compressors of the open silent-valve head, water-cooled, piston type. It has a heat absorbing capacity equivalent to 196 lbs. of dry ice per 24-hour day under similar operating conditions.

The same standard unit can be furnished 60" deep, or deeper.

Special Units can be furnished to suit specific applications.

EFFECTS SAVINGS UP TO $2825 PER YEAR OVER DRY ICE—Laboratory tests prove that the cost for removing 1000 B.t.u.'s per 24-hour day over a period of one year with dry ice is $3000.00, as compared to the $175.00 electric current consumption of the Deepfreeze over the same period of time.

FREE DATA *and proof of the outstanding success of the Deepfreeze method for chilling metals are included in this booklet. Write for your copy today.*

SOME PRESENT PRODUCTION USES OF DEEPFREEZE METAL CHILLING

● The Deepfreeze Santocel Cascade Industrial Unit is ideal for production chilling of various metals in many industries. These descriptions may suggest a profitable application to your product . . . Deepfreeze engineers will be glad to study the possibility of saving time and money through the proper application of cold to your production.

● Shrinking of metal at −100° F. to −120° F. has made it possible to assemble sleeve bearings and ball or roller races otherwise requiring a press-fit, by merely slipping them into position after chilling.

● Spoilage of expensive bearings and races and loss of time for replacement are *entirely eliminated.*

● Storing and chilling annealed aluminum alloy rivets retard age hardening. Rivets can be kept soft enough for heading for a period of two weeks.

● For seasoning, setting and counter annealing, tool and gauge shops use Deepfreeze Chilling to eliminate the wear, runout and other obstacles to precision craftsmanship.

● Testing of metals at sub-zero temperatures has made it possible to study the reactions of aircraft instruments to stratosphere flying. Aircraft engine lubricants can also be perfected for sub-zero starting.

FREE ENGINEERING ASSISTANCE

● Deepfreeze engineers are available to assist you in obtaining the advantages of sub-zero metal conditioning. Send us an outline of your problems together with parts or prints for a preliminary calculation and test—no obligation.

Deepfreeze Division, MOTOR PRODUCTS CORPORATION

2327 DAVIS STREET, NORTH CHICAGO, ILLINOIS

C-F POSITIONERS *are universal tools ... for handling and holding work*

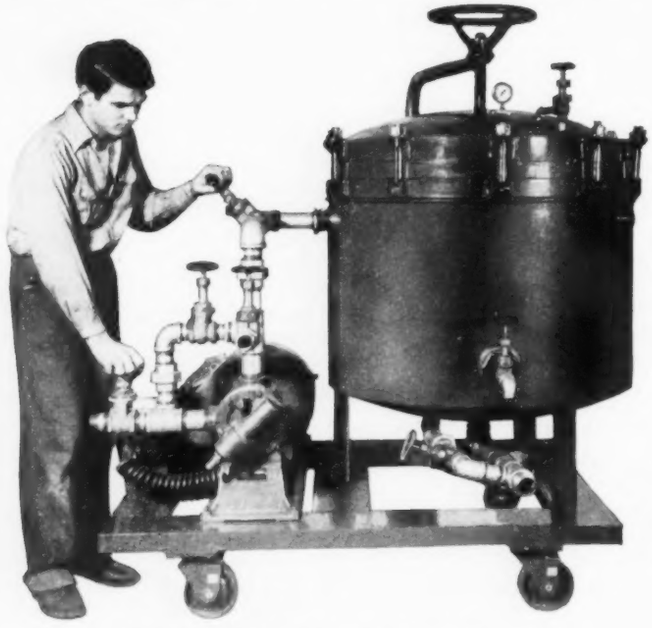
Capable of tilting, turning and holding giant weldments and assemblies so that every weld can be made down hand, C-F Positioners are also time-saving, labor-saving and cost-cutting tools wherever the approach to the work effects its efficiency—as when chipping, snagging, grinding, flame hardening, hand and angular drilling, etc. Today C-F Positioners are found not only in the welding shops but in machine shops, die shops and production lines as well. C-F Positioners come in 6 sizes, in capacities from 1,200 lbs. (hand operated) to 30,000 lbs. Each is a universal tool, pedestal mounted, adjustable for height, and has a table that turns completely around and tilts at any angle to 135° from horizontal.

(Left) Illustrates how "C-F" adjustable height feature assures ample floor clearance for "any" job.

Write for Bulletin WP 22

CULLEN-FRIESTEDT CO.,
1313 S. KILBOURN AVE. CHICAGO, ILLINOIS

Preserve those tool bits!



Capacities to 10,000 gallons per hour

SAVE grinding time, man hours and oil

SPARKLER
HORIZONTAL PLATE FILTERS

There's no limit to the treatment you can give your cutting oils with these Sparkler Filters of advanced design and performance. Coarse particles may be eliminated from a thin oil, or a heavy oil completely purified and dehydrated, with equal facility and efficiency.

With Sparkler filtration the wheel cuts faster and lasts longer—the quality of the work is vastly improved. It accomplishes removal of the microscopic abrasive enemies so destructive to cutting tools. Filtering with the Sparkler keeps the oil clean, making disinfectants more effective in reducing dermatitis.

Write for full demonstration right in your plant—no obligation. Or send us a sample of your dirty oil for filtering test.

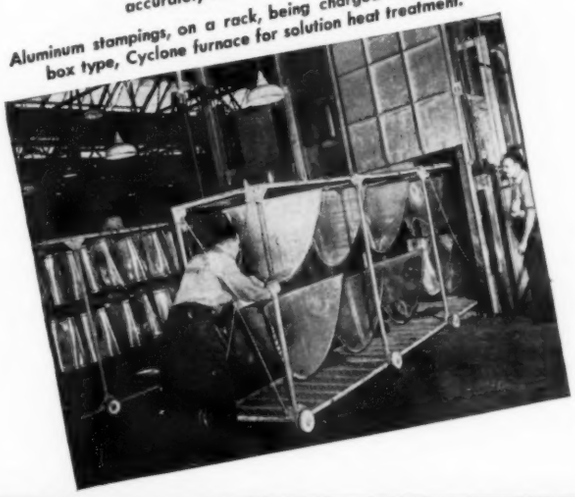
SPARKLER MANUFACTURING CO.
275 Lake Street MUNDELEIN, ILLINOIS

SPARKLER FILTERS
WITH THE HORIZONTAL PLATES

LINDBERG FURNACES IN THE AIRCRAFT INDUSTRY

Typical method of handling magnesium castings in a vertical or pit type Cyclone. Aluminum castings handled in the same manner are quenched and aged without removing the work from the fixture.

A mass load of magnesium castings which are uniformly and accurately heat treated daily in this Cyclone box type furnace.



Aluminum stampings, on a rack, being charged into a large box type, Cyclone furnace for solution heat treatment.

ALL THE LEADING AIRCRAFT MANUFACTURERS and subcontractors in the country employ Lindberg Cyclones for the precision heat treatment of aircraft parts. In the heat treatment of aluminum and magnesium alone, the Cyclone is ideally suited because of its heating uniformity and accurate temperature control. The high quality of the tons of heat treated stampings, castings and forgings which are turned out of Cyclones each day, is due to the famous Lindberg 100% forced convection heating principle.

HEATING UNIFORMITY

Uniform heating is the result of great volumes of air being circulated at a two-mile-a-minute velocity through the work chamber so that exactly the same degree of heat is forced to every part of the charge. Under this condition, it is impossible for damaging heat differences to exist. Repeated multiple point pyrometer tests, using 6 or more thermocouples at various points in the work chamber, show a straight line on the temperature recorder.

The Lindberg Input Control governs the input of heat in accordance with the demands of the charge. When little heat is needed, little heat is automatically supplied, thus eliminating disastrous surges in heat supply.

WHAT THIS MEANS TO THE AIRCRAFT INDUSTRY

It means that production is necessarily greater because large, dense loads are heated with an assured uniformity. It means a smooth flow of non-ferrous heat treating production. It means that each piece of vital equipment is not held up because of wasteful rejection, and too, it means that you have one less production problem to worry you in these days of wartime pressure.

These furnaces for the heat treatment of non-ferrous metals have been built in a wide range of sizes, in both vertical and box type designs.

The vertical or pit type Cyclone comes in ***80 different standard sizes*** of varying diameters and depths. The box type Cyclone is made in ***58 different standard sizes.***

LINDBERG ENGINEERING COMPANY
2445 WEST HUBBARD STREET • CHICAGO

CYCLONE FOR LOW-COST ACCURATE TEMPERING

LINDBERG FURNACES

HYDRYZING FOR SCALE-FREE AND DECARB-FREE HARDENING

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

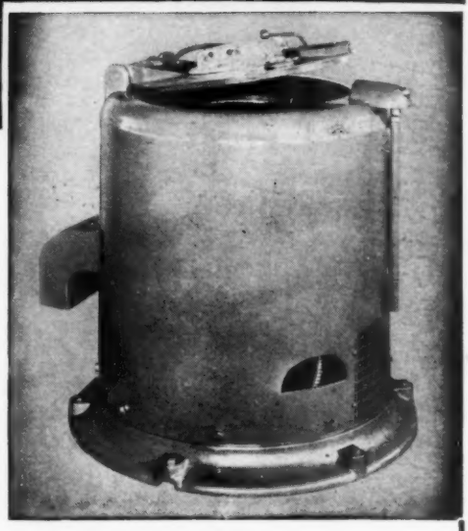
In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

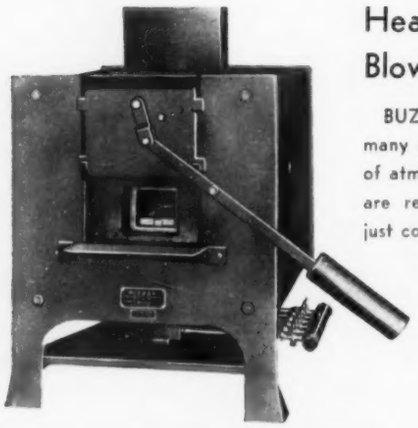
Send at once for details of Barrett Typhoon Washer



Barrett Centrifugal Washer — made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT CO. WORCESTER, MASS.
Designers and Builders of Centrifugal Machinery

BUZZER INDUSTRIAL GAS FURNACES



Heat Quickly Without Blower or Power

BUZZER FURNACES — The result of many years experience and development of atmospheric gas burning equipment—are ready for immediate operation by just connecting to gas supply. No blowers, motors or auxiliary equipment are required. They are designed for utmost economy, efficiency and service.

"Super Heat" High Speed Muffle Furnaces

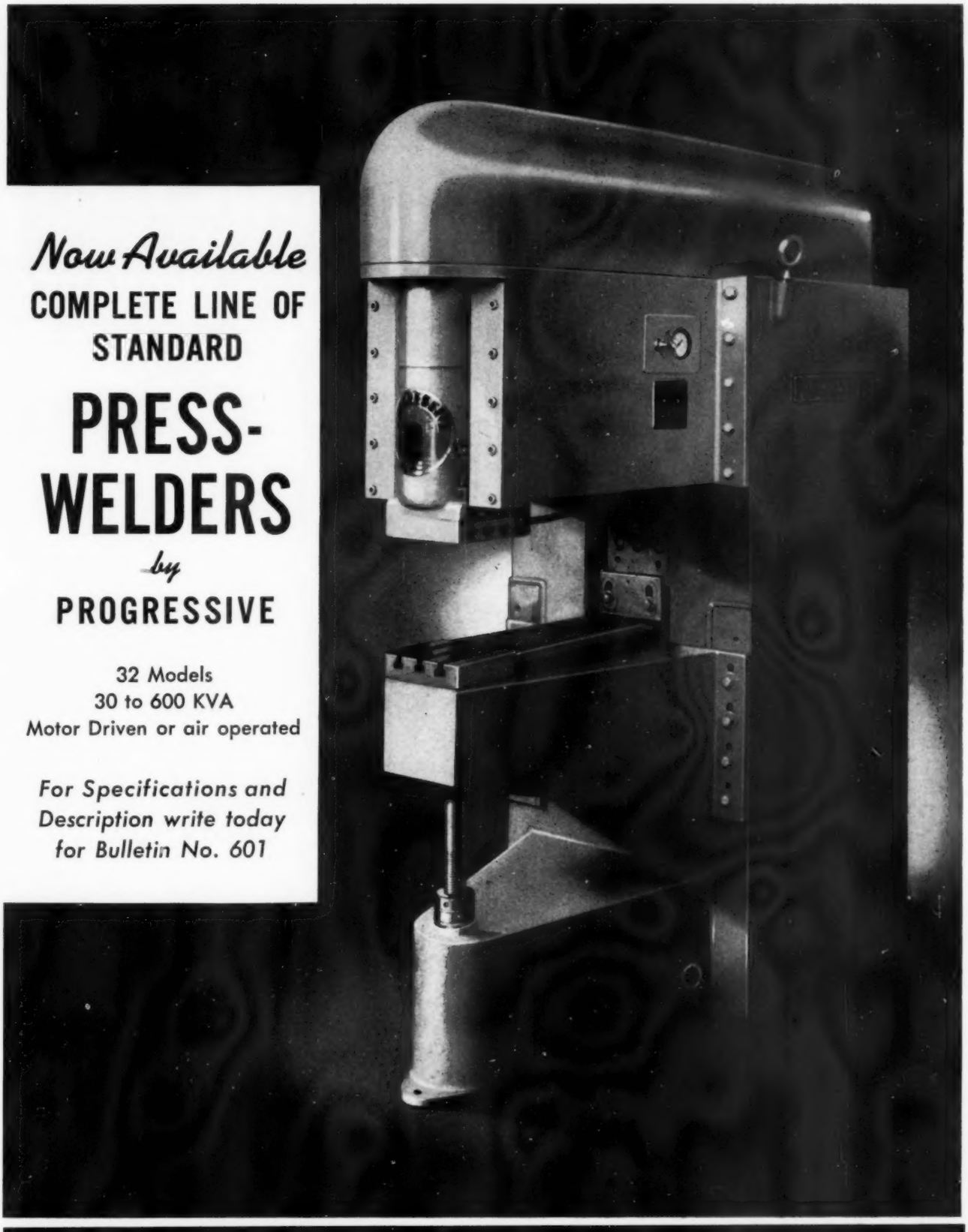
A temperature of 2400 F degrees in 90 minutes is easily attained in these BUZZER FURNACES. Low installation expense is assured because it is only necessary to connect to gas supply. Other features include protective atmospheres, low fuel consumption and flexibility of control. These units are ideal for heat treating high speed and alloy steel. Made in several standard sizes in bench types, also large floor types.

Atmospheric Pot Furnaces

While designed for cyanide, salt bath and lead hardening, these BUZZER Furnaces may also be used for melting zinc, aluminum and lead. Temperatures up to 1650° F. can be reached in 1½ hours. Speed, long life and high economy and efficiency are outstanding advantages.

Send for the complete 32 page "BUZZER" Catalog.

CHARLES A. HONES INC., 121 So. Grand Ave., Baldwin, N. Y.



Now Available

COMPLETE LINE OF STANDARD

PRESS-WELDERS

by

PROGRESSIVE

32 Models
30 to 600 KVA
Motor Driven or air operated

For Specifications and Description write today for Bulletin No. 601

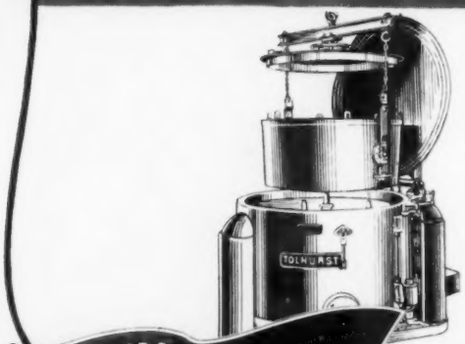
PROGRESSIVE WELDER CO.

SEAM, PROJECTION & BUTT . . . *Electric Welding Equipment* . . . PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE DETROIT, U.S.A.

CHIP WRINGERS

For Reclaiming Cutting Oil



For High Achievement in War Production

OUR COMPANY'S plant at East Moline has just received the Army-Navy "E" award—an honor not easily won nor lightly bestowed.

The "E" stands for EXCELLENCE

EXCELLENCE . . . in quality and quantity of production.
EXCELLENCE . . . in overcoming production obstacles.
EXCELLENCE . . . in avoiding work stoppages.
EXCELLENCE . . . in maintaining fair labor standards.
EXCELLENCE . . . in training additional labor forces.
EXCELLENCE . . . in effective management.
EXCELLENCE . . . in safety, health and plant protection.
EXCELLENCE . . . in utilizing sub-contracting facilities.

Tolhurst Centrifugal Division shared in this award by its production of Chip Wringers for reclaiming cutting oil. This honor now becomes the challenge—the challenge to achieve even greater production records while maintaining superior standards of quality and workmanship. *"We've won the 'E' flag. We'll keep it flying!"*

Tolhurst Centrifugal

DIVISION OF AMERICAN MACHINE AND METALS, INC.

East Moline, Illinois

Actual Reports show

Big Increase In Production of TOOLS • DIES PRECISION PARTS *with* DESPATCH FURNACES

Despatch Batch Type Furnace, gas heated, processing steel springs in a midwestern metal plant

Battery of Despatch Pot Type Furnaces, electrically heated, processing bearing parts at a large eastern plant

This is no time to compromise with production. Speedy, accurate heat treatment is needed to obtain the output of tools and dies your schedule requires.

Actual reports show that *greater* production of tools, dies and precision parts follows the installation of Despatch furnaces.

Investigate today. Learn the advantages which Despatch heat treating furnaces offer *your* plant. Available for prompt delivery are any of 64 standard models, pot or batch type (gas or electric fired). Also special models with latest material-handling systems.

WIRE, PHONE or write for a Despatch resident engineer; he will recommend the proper heat-treating furnace for your plant.

DESPATCH
OVEN COMPANY MINNEAPOLIS

1942 Equipment *plus* 37 Years Experience

DEVOTED TO THE "ALL-OUT WAR EFFORT"

in producing

SIER-BATH PRECISION GEARS

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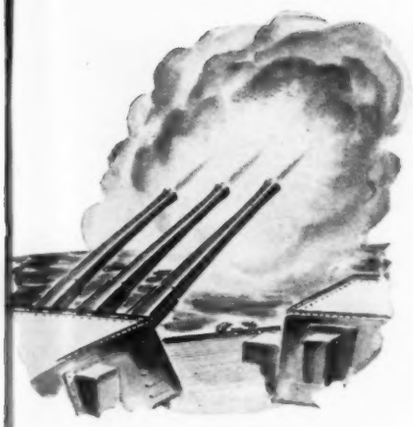

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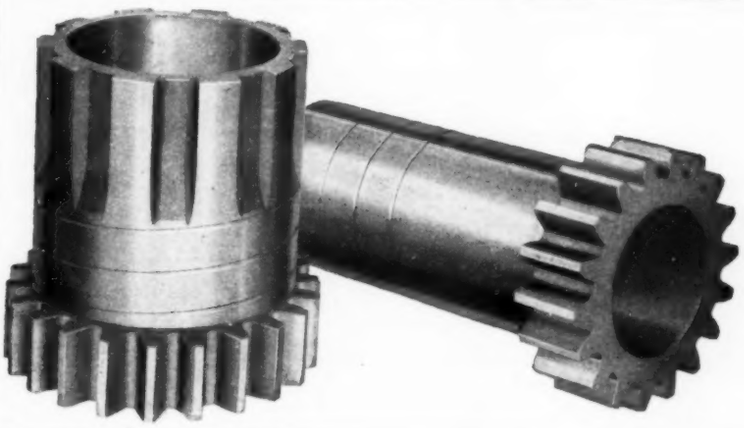

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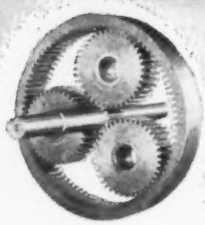
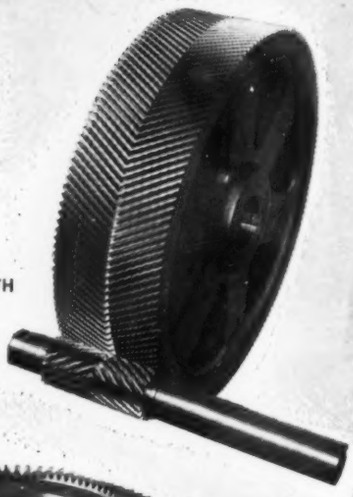
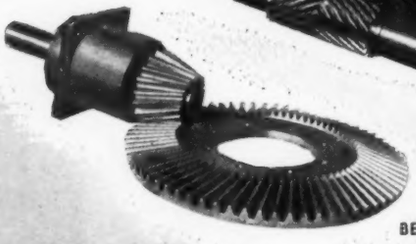


A SET OF PLANETARY GEARS



CONTINUOUS-TOOTH HERRINGBONE GEAR AND PINION



A SET OF SPIRAL BEVEL GEARS WITH PINION BEARING MOUNTING

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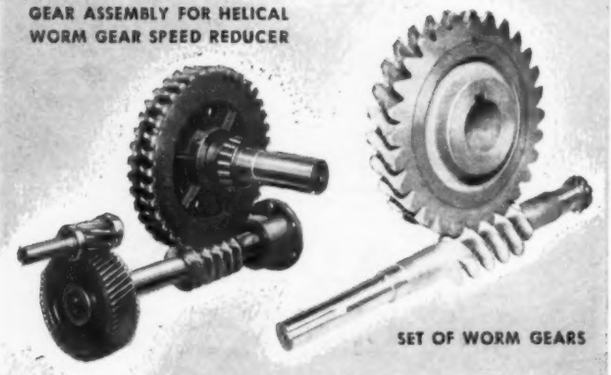

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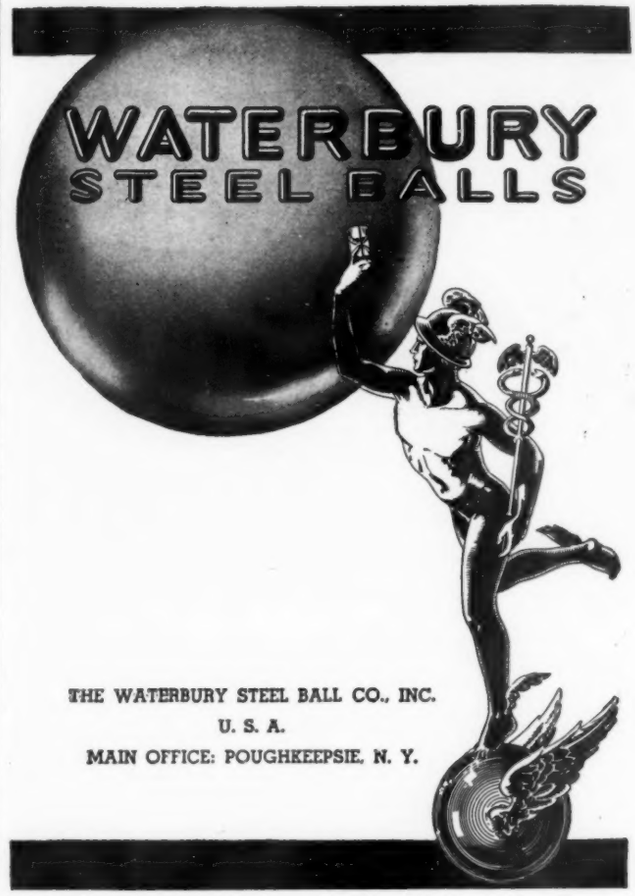

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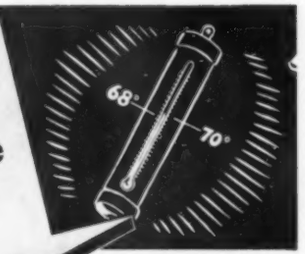

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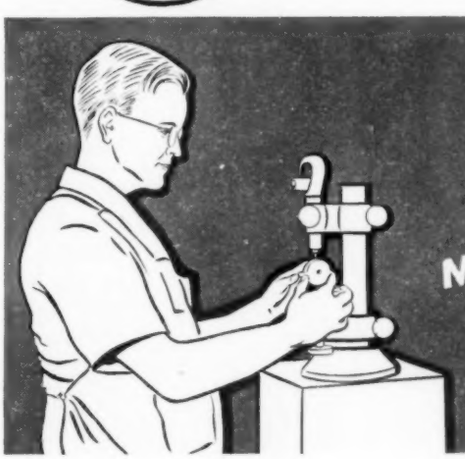

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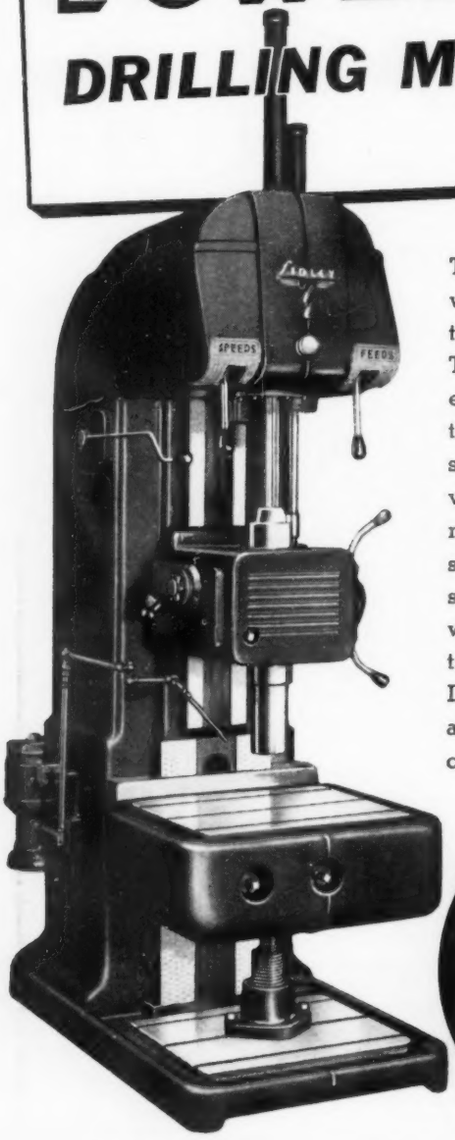

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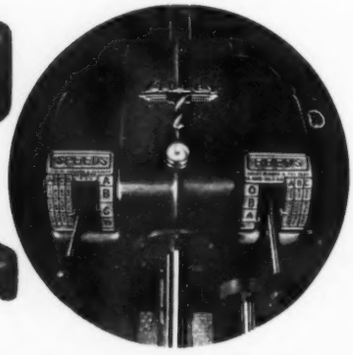

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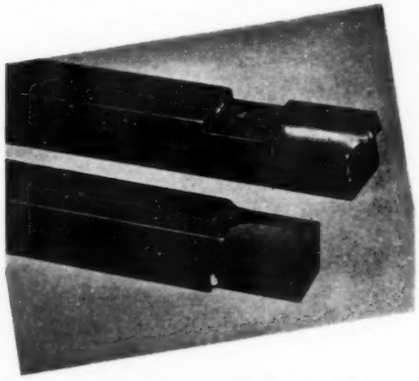

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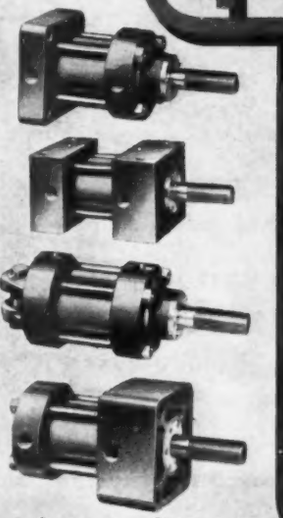

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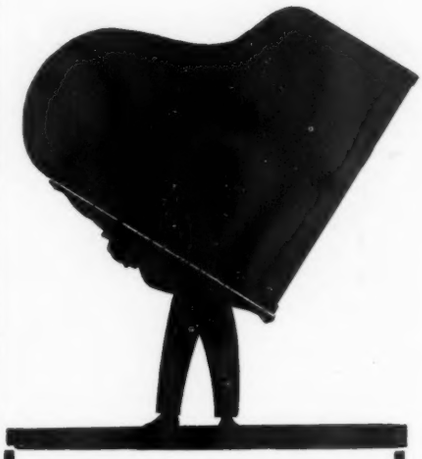

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That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★

Good advertising speeds information from those who have it . . . to those who need it.

■

McGraw-Hill Publishing Company, Inc.

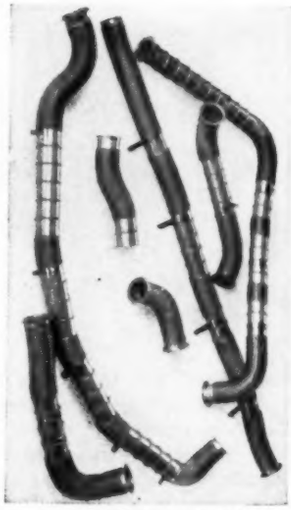
330 West 42nd Street New York

In War Time, It's . . .

FLEXPEDITE

★ **Achieve design flexibility, conserve vital materials, speed conversion, assembly and production by utilizing flexible metal connections—specifically..**

REX *Flexible* METAL HOSE



Units Shown are Typical Vari-formed Assemblies.

The many production types of REX Flexible Metal Hose offer the widest range of adaptability—for simplifying re-design problems where space limitations and flexibility are imperative—for conserving more critical materials—for solving every kind of fluid and gas handling problem.

REX Flexible Metal Hose speeds manufacture by facilitating assembly. It can be bent to position or "snaked" into place and coupled in a fraction of the time required to fit multi-plane pipe connection. Easily attached fittings for every requirement. REX Flexible Metal Hose withstands severe flexing and vibration. All in the interest of war time economy.

FLEXPEDITE *YOUR* PRODUCTION

Write for data and engineering recommendations on specific problems involving flexible connections.

REX-WELD Corrugated Flexible Metal Hose • REX-TUBE Interlocked Flexible Metal Hose
REX-FLEX Stainless Steel Flexible Tubing • AVIOFLEX Oil Line Hose • CELLU-LINED Hydraulic Hose

Copyright, 1942, Chicago Metal Hose Corporation, Maywood, Illinois

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean to include the advertising pages, as well as the editorial pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

Good advertising speeds information from those who have it . . . to those who need it.

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This Free Booklet May Help You Now

There are 23 McGraw-Hill Publications covering many branches of Business and Industry;—mining, metal-working, transportation, manufacturing, engineering design and heavy construction. Over a million readers are finding them constantly helpful in carrying out today's vital work in the army of production. Perhaps one of them would prove interesting and helpful to you. A 24-page illustrated booklet, describing each one in some detail, will be sent FREE, on request . . . this booklet has been prepared to help you select the paper which will serve you best. Just fill in and mail the coupon below.

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330 West 42nd St., New York, N. Y.

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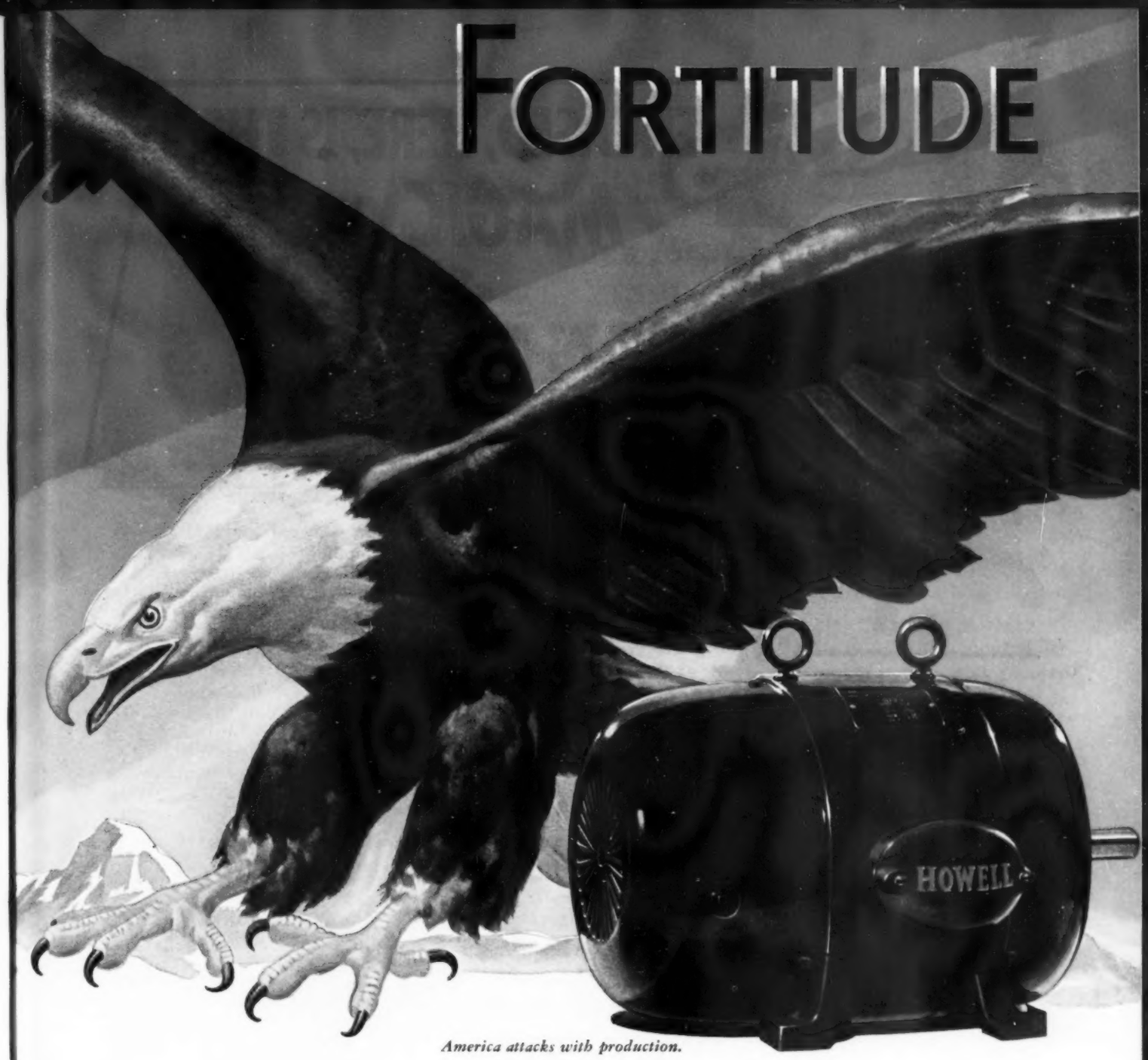
Our business is .....

FORTITUDE



America attacks with production.

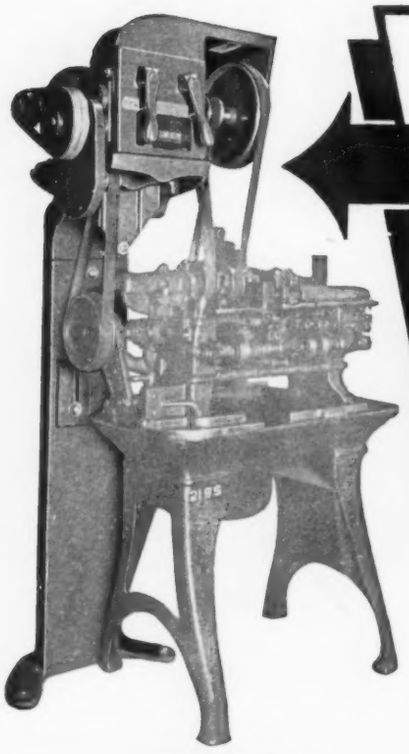
WE CAN be thankful, these days, for American Fortitude . . . The fortitude of our armed forces will bring victory on the fighting fronts . . . The fortitude of our workmen and manufacturers will overcome the plotting, planning, and more-than-eight-year production start on the part of the Axis; will enable us to out-produce the world in bombs, bullets, planes, tanks, ships . . . Howell Electric Motors are playing an important part in all of these vital war industries . . . They are holding their old friends, winning new friends, with their fortitude as exemplified by their ability to outperform and out-last on the production front. Howell Electric Motors are *better built* by an organization that's all-out for victory — by men and women who cherish the American ideals of liberty and free enterprise and are willing to sacrifice everything to protect them.

★ ★ ★ ★

The **HOWELL IDEA**
in Electric Motors
precision-built

★ ★ ★ ★

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN • *Manufacturers of Quality Motors Since 1915*



ENCASED, HERE, IS THE *MAGIC* OF THE TURNER UNI-DRIVE

Motorizes Machine Tools

HERE'S *proved, dependable* aid in stepping up and keeping your production at full speed... the TURNER UNI-DRIVE. In many of America's largest plants this *successful* motor drive is speeding production, saving labor and time, cutting power costs. So sure are we that it will prove a big aid in your business that we guarantee Uni-Drives for one year—subject to return for full credit within 60 days if not satisfactory.

UNI-DRIVE eliminates overhead counter shafts. No belts to shift. Increased efficiency of machine and operator. Installed in 2 to 4 hours. All the advantages of geared head with belt drive smoothness. Big saving in power. Sizes ¼ to 20 H. P.

Investigate ... and be convinced! See your dealer at once, or write us for full information and prices.

(DEALERS: Write for full details about this fast-moving line for your territory.)

THE TURNER UNI-DRIVE COMPANY

(Sales Division: Turner Machinery Co.)

3416 Terrace Street Kansas City, Mo.

SOME USERS OF TURNER UNI-DRIVE

- American Brake Shoe & F. Co.
  - Kellogg Division
  - Southern Wheel Division
- Arnold Schwinn & Co.
- Augusta Arsenal
- Automatic Sprinkler Co. of America
- Bendix Aviation Corp.
- Burgess Battery Corp.
- Cessna Aircraft Corp.
- Champion Dishwashing Co.
- Chicago, Rock Island & Pacific R. R. Co.
- Chicago Screw Company
- Combustion Engineering Co.
- Congoleum Nairn, Inc.
- Doehler Die Casting Co.
- Driver Harris Co.
- Electric Auto-Lite Co.
- Fostoria Screw Products Co.
- Frankfort Arsenal
- Frisco Lines
- Hartzell Industries
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- International Projector Co.
- Kohler Corp.
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- Lion Mfg. Co.
- Missouri Pacific R. R. Co.
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- Ohio Pattern and Fdry. Co.
- Oneida, Ltd.
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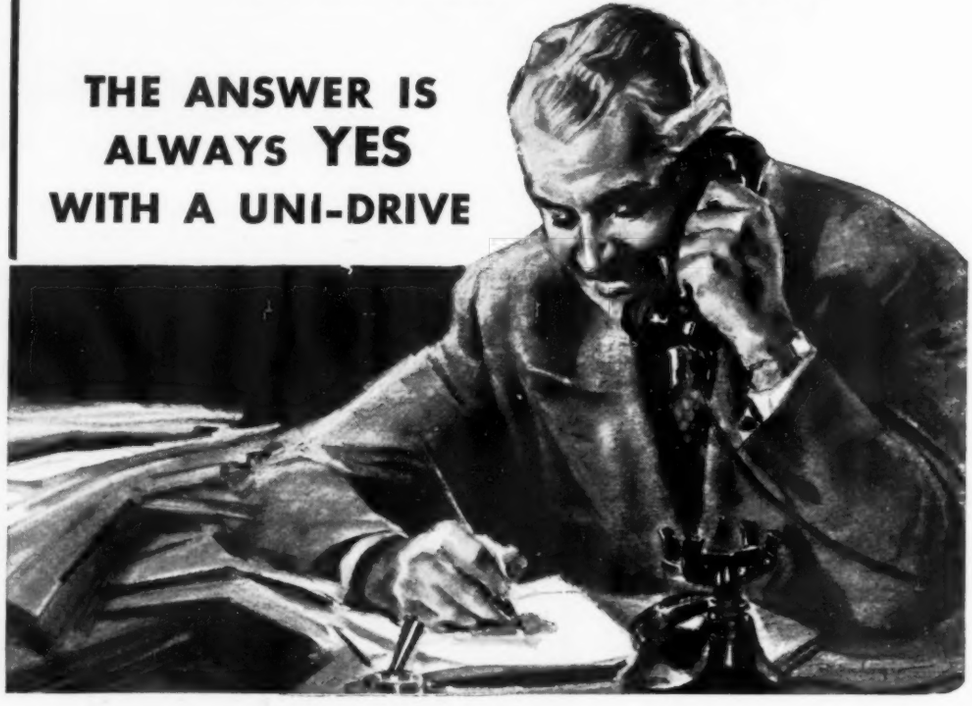
- Republic Steel Corporation
- Revere Copper and Brass, Inc.
- SKF Industries
- Sullivan Dry Dock Co.
- Thos. A. Edison Co.
- The Timken-Detroit Axle Co.
- Toledo Scale Co.
- The Todd Company
- Wabash Railway Co.
- Wagner Electric Co. (6)

THE ANSWER IS ALWAYS YES WITH A UNI-DRIVE



DAYTONS STAND GUARD

OVER 100,000 OF AMERICA'S INDUSTRIAL FRONTS

On more than 100,000 vital industrial fronts Dayton V-Belts vigilantly guard the output of every conceivable type of machinery essential to America's global war. And on this nation-wide production front, Daytons are pledged and proved to save precious time and protect machinery which is invaluable to our war effort.

Cool running, long life Dayton V-Belts have the strength, flexibility and gripping power to assure closer speed control—cut power losses and reduce maintenance and adjustments to a negligible minimum.

Furthermore, built-to-bend Daytons operate on short centers and permit the efficient operation of more high-speed machinery per square foot of floor space.

Located nearby to serve your wartime needs is a Dayton Distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. So, for service or for helpful suggestions regarding the conservation of V-Belts through proper application and maintenance, call your nearest Dayton Distributor.

THE DAYTON RUBBER MFG. CO.
World's Largest Manufacturer of V-Belts
DAYTON, OHIO

DAYTON RUBBER EXPORT CORPORATION
38 Pearl Street New York, N. Y. U. S. A.

THROW YOUR SCRAP INTO THE FIGHT!

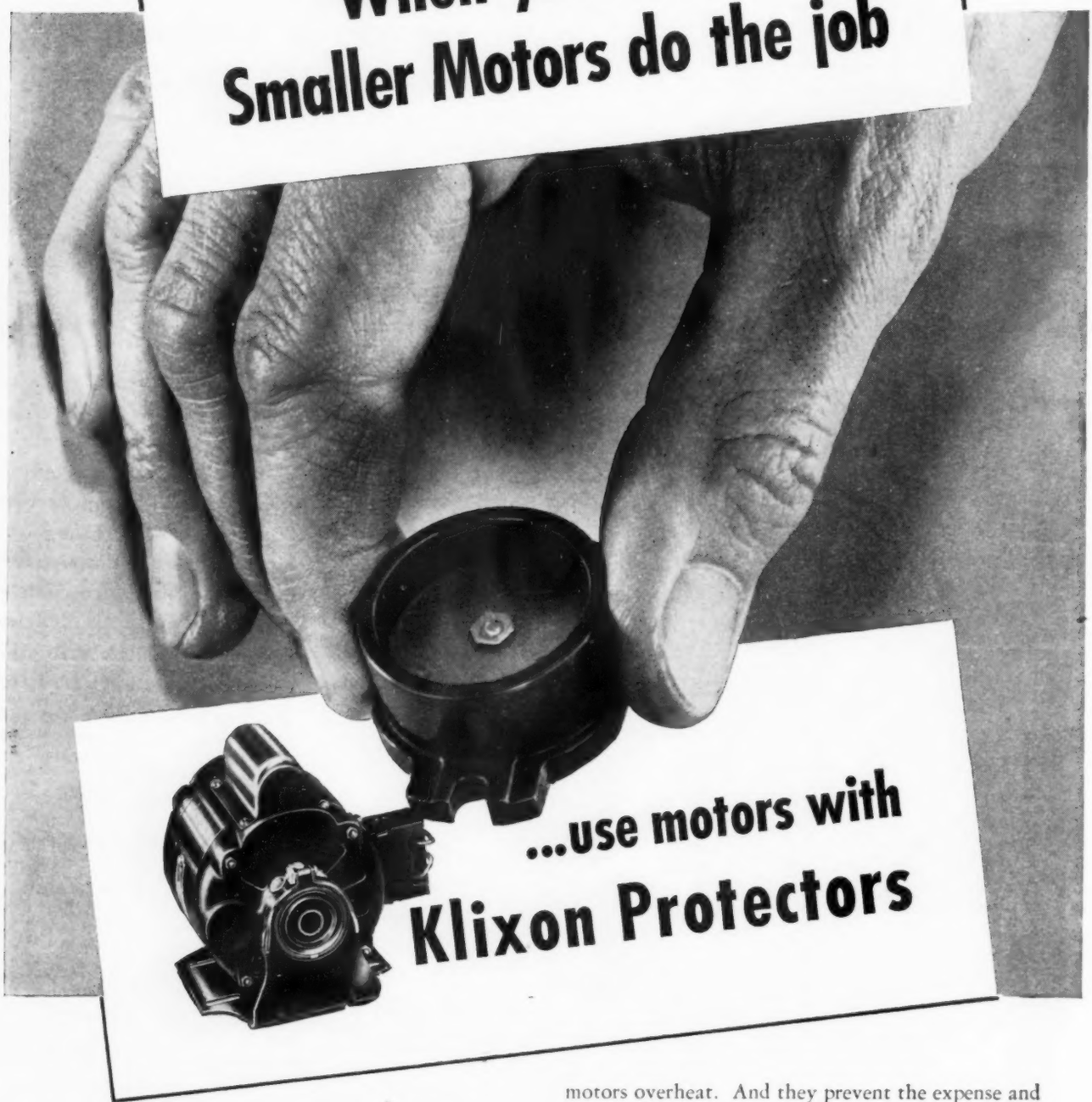
Dayton V Belts

LIFELINES OF POWER VITAL TO VICTORY

THE GREATEST NAME IN V-BELTS

Copyright, 1942, The Dayton Rubber Manufacturing Co.

When you make Smaller Motors do the job



...use motors with Klixon Protectors

When you buy motors closer to your requirements—it will save vital materials. But in buying smaller motors, get motors with built-in Klixon Protectors. A built-in Klixon Protector allows a motor to work at peak capacity continuously *with safety*. The instant a dangerous overload exists, the protector cuts the motor off the line, thereby preventing a burnout.

By preventing motor burnouts, Klixon Protectors save the vital materials that go up in smoke when motors overheat. And they prevent the expense and delays of rewinding jobs or motor replacements.

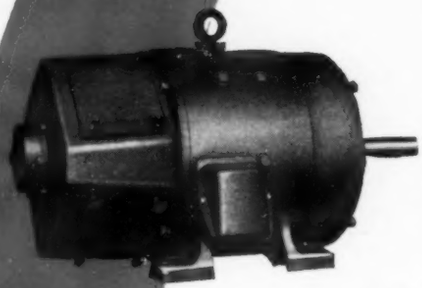
Any motor manufacturer can supply you with motors having built-in Klixon Protectors—A.C. all sizes; D.C. up to 30 volts. Insist on this material—and power-saving protection.

KLIXON

TRADE MARK REG U.S. PAT. OFF.

Spencer Thermostat Company • 1511 Forest Street, Attleboro, Massachusetts

CENTURY MOTORS
are Famous for Their Ability to "Keep a-running"



7½ HP Direct Current Ball Bearing, Fabricated Steel, Water Proof Navy Motor

They are serving the Armed Forces of the United Nations with a distinction that is important to you.

Standing the Shock of Battle

In the Naval Service, in typical applications, modern Century Motors aboard ship must stand up under the shocks of gun-fire and bombing attacks. They are especially built to take the punishment of actual combat.

And the Demands of War Production

Similarly, on the production front, Century Motors are staying on the job under 24-hour, continuous, 3-shift production. They take the shock loads of the heaviest machinery, yet their unusual freedom from vibration helps speed up the finest precision machine tool production.

For the Future

Because of War demands, Century is now engaged in the production of a wider range of motors, generators, and other rotating electrical apparatus than ever before. As a result, when Victory has been won, we'll meet your requirements with an extended, improved, and more complete line than we have offered since our founding in 1903.

Because of what Century is doing today — we'll serve even better tomorrow.

3 HP Direct Current Ball Bearing, All Steel Navy Motor

CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis, Missouri
Office and Stock Points in Principal Cities

Century MOTORS

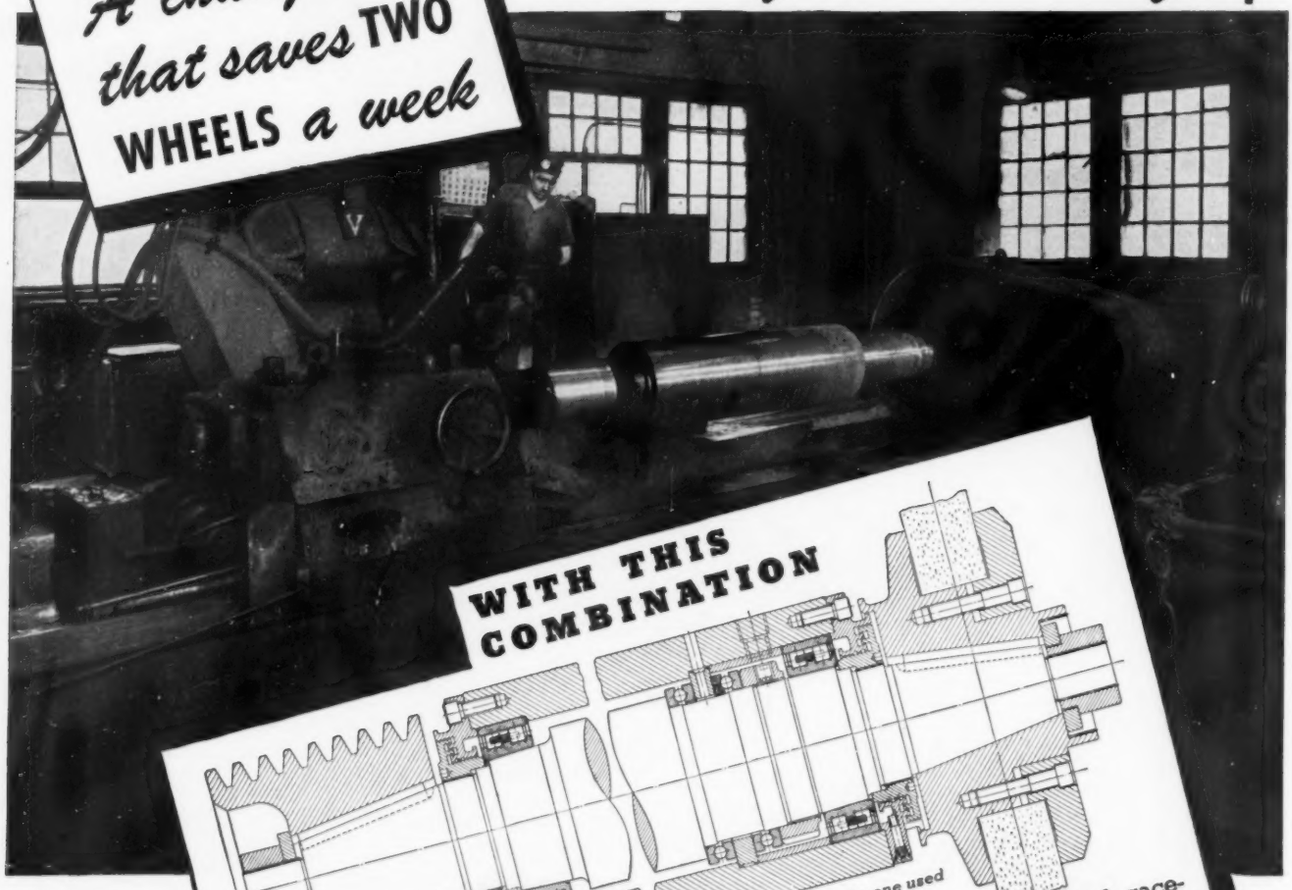
301

Century Motors, both alternating and direct current, are being produced for the operation of the many kinds of machine tools, industrial fabricating and processing machinery used in the manufacture of ammunition, munitions, cargo and combat ships, and for driving their operating equipment.

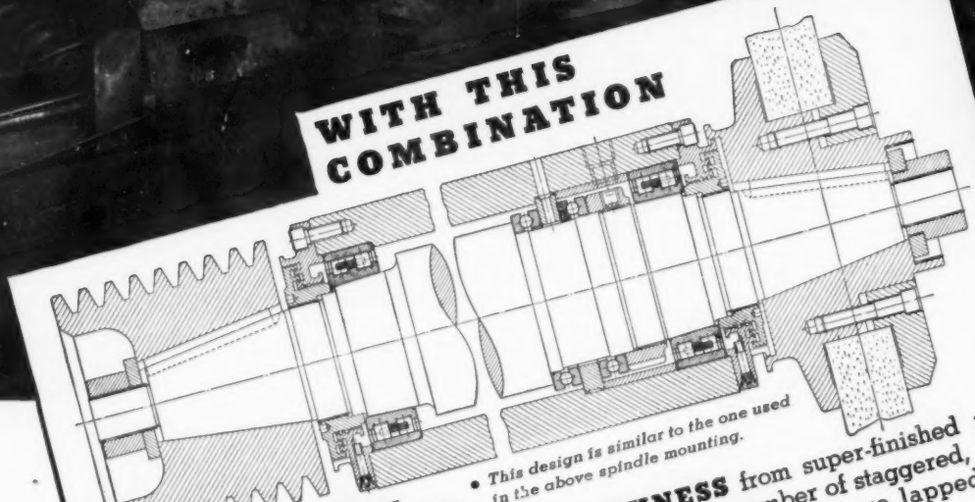
One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World.

Smoothness FOR *long wheel life!*

A changeover that saves TWO WHEELS *a week*



WITH THIS COMBINATION



This design is similar to the one used in the above spindle mounting.

- **SMOOTHNESS** from super-finished raceways and a large number of staggered, ultra-precision rollers which are lapped by a special method.
- **RIGIDITY** from long surface contact of rollers.
- **CONSTANT LOW TEMPERATURE** due to low friction.

CHANGING over from a ball bearing spindle to an SKF roller bearing spindle made a BIG difference in the performance of this roll grinder. *The rigidity and smoothness of the bearings increased the ratio of steel removed to wheel wear sufficiently to save two grinding wheels per week.* Furthermore, wheels can be used down to a considerably smaller diameter than formerly. Anything that *helps* Production *hurts* the enemy of us all. 5160

SKF INDUSTRIES, INC., PHILADELPHIA, PA.

SKF

BALL AND ROLLER BEARINGS

It's too small for ALL the jobs to be done

HELP S-T-R-E-T-C-H IT

Consider these things when fiquring motor sizes

Don't overlook this hidden factor

Both N.E.M.A. and A.S.A. Standards specify that general-purpose electric motors shall be suitable for carrying CONTINUOUSLY a load of 1.15 times the rated load. Thus, a 5 hp. motor can carry 5¾ hp.

Make use of this. Save a frame size and S-T-R-E-T-C-H vital materials—copper, steel, aluminum.

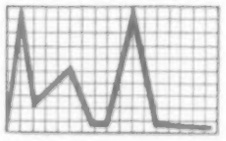
RELIANCE

WITH *copper* one of our most critical materials it's *our* job and *your* job to see that it gets to the spot where it does the most damage to our enemies. You want more motors. We shall have less copper for building them.

Here are some of the things that can be done about it:

Make more careful studies of machine loads. Don't over-motorize just to "play safe." We are in a spot where we must do some conservative gambling.

CHECK DUTY CYCLE . . . . Maybe an intermittent-duty motor will do, using a frame size smaller than the continuous-duty motor.



CHECK TORQUE REQUIREMENTS. Maybe a motor with special torque characteristics will take a frame size smaller and save vital materials.

CHECK SPEEDS. If it's a constant-speed motor, save a frame size by going to next higher speed, 1200 rpm. instead of 900 rpm.; 1800 rpm. in place of 1200 rpm.

If it's an adjustable-speed d-c. drive, can you get by with a higher minimum speed? A 1 to 3 range instead of 1 to 4? For example, using 500-1500 rpm. in place of 400-1600 rpm. saves a frame size.

Could you get along with a single-speed a-c. motor or a single-winding multi-speed motor instead of a two-winding multi-speed motor?

CHECK VOLTAGES. Specify single-voltage a-c. motors. They use but 3 leads instead of 9.

This job involves Application Engineering, which is our business. Reliance men skilled in this work are ready to help and are available in the industrial centers listed below.

RELIANCE ELECTRIC & ENGINEERING COMPANY
1088 IVANHOE ROAD • CLEVELAND, OHIO

BIRMINGHAM • BOSTON • BUFFALO • CHICAGO • CINCINNATI • DETROIT
GREENVILLE, S. C. • HOUSTON, TEXAS • LOS ANGELES • MINNEAPOLIS
NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ST. LOUIS
SAN FRANCISCO • SYRACUSE, N. Y. • AND OTHER PRINCIPAL CITIES

RELIANCE A-C D-C MOTORS

How to make your SLEEVE TYPE BEARINGS *last longer*

Most bearing failures are due either to improper fit or neglect. While manufacturers engaged in producing war material can still secure replacements with a minimum of delay, it is not only good management but also a form of patriotism to make every bearing deliver its full measure of power and efficiency. Bronze sleeve type bearings contain three very essential metals . . . copper, tin and lead. Help conserve these precious metals by following these instructions:

Inspect . . .

Adopt a regular period of inspection. In machinery that operates constantly the bearings should be checked each day. All other applications at least once a week. Make certain that bearings are in perfect alignment to prevent excess wear.

Clean . . .

Foreign matter, particularly of a gritty or abrasive nature is the greatest menace to bearings. By keeping the surroundings clean, you can prevent early bearing deterioration. A few minutes spent in cleaning up all applications will pay big dividends in increased bearing life and efficiency.

Lubricate . . .

Lubrication is the life blood of every motive unit. Start now to adopt a regular plan of lubrication for every bearing. Make sure you are using the right type of lubricant, the right grade and that it is clean.

Replace . . .

If failure is inevitable, order in advance. Replace all worn bearings *before* they actually fail. Remember that bearing performance and bearing life is the true gauge of quality . . . not purchase price.

Write for a copy of our new catalogue. It lists and describes the most complete stock sleeve bearing service on the market. Every item is of the highest quality possible. Distributors in every industrial center are ready to serve you.

From Stock

GENERAL PURPOSE BEARINGS

Cast Bronze, over 850 stock sizes, machined, ready for assembly.

ELECTRIC MOTOR BEARINGS

250 individual types. Correct in design, alloy and tolerances.

Ledaloyl
SELF-LUBRICATING BRONZE BEARINGS

Powder metallurgy at its best. Contain up to 35% oil by volume.

JOHNSON BRONZE COMPANY

Sleeve BEARING HEADQUARTERS

515 SOUTH MILL STREET • NEW CASTLE, PA.

HOW REEVES HELPS SHARPEN ★ THE *Eagle's Claws*

. . . by Providing Production Machines with "Stepless" Speed Adjustability

The American eagle has already bared its claws, and used them with telling effect. Daily those claws are being sharpened—wings strengthened.

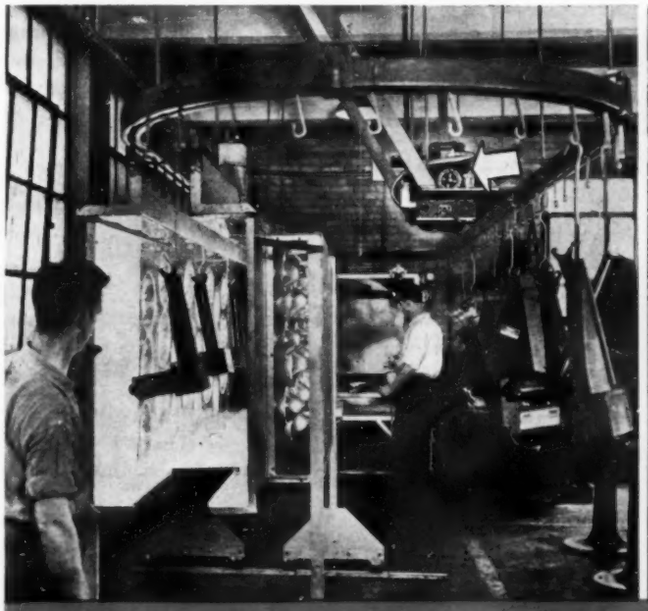
For America is not satisfied with building more planes, tanks, and guns than all our enemies put together. The planes must fly higher and faster, the tanks must deliver more devastating blows, the guns must shoot farther and harder.

And to achieve all of these results, REEVES Variable Speed Control for production machines is playing an important part—helping men and machines to produce maximum output by providing the right speed for each job and process; saving workers' time; saving materials and reducing the number of "rejects"; enabling new and unskilled workers to hit their stride in minimum time. Production increases from 25 to 50 per cent are not unusual.

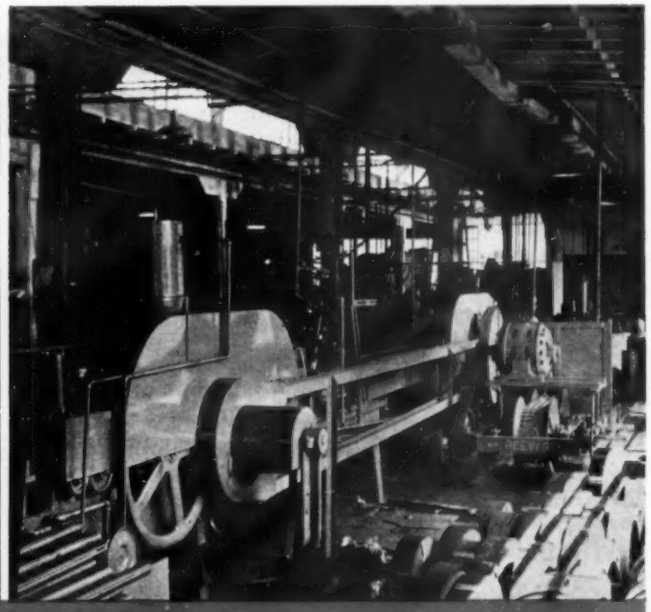
Write for booklet AG-423, "More Output for Victory," which illustrates and describes twenty-nine installations of REEVES Transmissions, Motodrives and Vari-Speed Motor Pulleys, with examples of increased productivity. We maintain a nation-wide staff of factory-trained speed control engineers. A member of this organization is located near you. *Shall we have him call?*

REEVES PULLEY COMPANY, COLUMBUS, INDIANA

REEVES Vari-Speed Motor Pulley regulates straight line production drying of industrial finishes by infra-red process—giving baked finish in any baking cycle from 8 to 18 minutes—a record-breaking time.



This tubing machine, driven through a REEVES Transmission, forms, welds, sizes and cuts to lengths up to 90 inches of tubing per minute—a four-way process that spits out airplane parts machine-gun style.



REEVES *Accurate Variable* Speed Control

America needs a Food Administrator – NOW

IN war or in peace, you and your fellow Americans require 1,465 lbs. (raw weight) of food every year. Soldiers require even more.

In all, for ourselves and our allies, America must produce, process and transport 250 billion pounds of food per year, for the duration, and for many years thereafter.

► Don't try to remember that figure, but *do* remember that food processing is a huge industry, in a high state of technical development, but not yet fully coordinated into the war effort.

The food industry needs over-all coordination, comparable to long-last rubber coordination. America needs an administrator of food supply; to assure priorities in equipment and transportation and to end conflicting and overlapping committee jurisdiction.

If the food supply gets into a tangle, through lack of a comprehensive plan, the result will make the rubber shortage seem a picnic in comparison.

► In the impending pandemonium, the Food Production Engineer will be strictly in the middle. He is neither a grower nor a global strategist, but a production man who must needs wait for government to call its shots on growing, equipment production and distribution.

The Food Production Engineer must see that the food is grown in proper quantities, at proper distances from his plant, and delivered in perfect condition . . . From that moment, he has all the problems of ordinary manufacturing, plus the job of contriving to retain the fleeting qualities of color, aroma, taste, texture and nutritive value which nature intended only for a few brief hours of ripeness.

That was tough to do, even in the days of unlimited refrigeration and canning. But under the urge of saving cargo space for men and munitions, new miracles have been worked.

Fortunately for us, in the continuous battle between bulk and low cubic content, the latter is winning.

Food Production Engineers—by developing machines and processes for trimming and compressing—have reduced whole sides of beef to a carton the size of a suit box.

► They have replaced sunken refrigerator ships by lining the holds of ordinary cargo vessels with boxes of frozen lard. Preserved by this Yankee "ice house" trick, frozen meats arrive overseas in perfect condition—while the lard goes to allied explosives plants for making TNT.

Eggs, stripped of their shells, travel through a fabulous array of processing machines, leaving space-taking water in America, but sending every ounce of energy-giving food value to our far-flung armies and allies.

When the Food Processor gets through with a basket of ripe tomatoes, you can hold the resulting cellophaned package in the palm of your hand . . . and only replaceable water has been lost.

► The work these men are doing will easily be the equivalent of launching a ship a day, as the processes which have been perfected are applied in more and more food plants.

If, under the constant pressure of tire, tin, and freight-car shortages, you find yourself sitting down to meals of dehyrated meats, fruits and vegetables, you can thank the Food Production Engineer for the fact that the tomato dishes will be ripe—red and delicious in taste, that soups are full-flavored and nourishing. That nothing has been lost but the water you have replaced.

Reprints of this advertisement are available in handy booklet form.

McGRAW-HILL PUBLISHING COMPANY, Inc.

330 WEST 42ND STREET • • NEW YORK

This advertisement appeared in a group of newspapers on Tuesday, October 13, 1942

How do you get the cube root of a cow?

READ the newspaper advertisement, reprinted opposite, and you'll see we are telling the public (and government) about the job engineers are doing in stuffing bigger food production into fewer ships.

When you get to that part of the ad that tells about Food Engineers reducing a cow's carcass to the size of a couple of suit boxes, you will have reached the point where McGraw-Hill really lives.

In Food Production, too, it's our job to collect the "how-to-do-it" news on each new advance in technology and equipment, and pass on this information to an entire industry.

The Industrial Press of America implements the exchange of ideas, which is a national characteristic and one of the secrets of our industrial development.

Through the interchange of ideas, made possible by the Industrial Press, the sum of American technical genius is greater than the sum of its parts.

If a food engineer in Illinois learns how to add and control Vitamin A in a food product, all food manufacturers learn how it was done, through a magazine like FOOD INDUSTRIES.*

If a manufacturer develops a new dehydrating machine, production men learn what it will do and how it operates, through the informative and helpful advertising that is characteristic of the Industrial Press.

No matter what your industry or your job, you can probably remember many instances where an industrial magazine has helped you find a solution to a production problem.

But valuable as they are, Industrial Magazines cost only a few dollars per year.

That's why the route slip is so puzzling. If a man needs to see a magazine at all, he should not be under pressure to pass it along.

For help in studying the proper distribution of technical magazines among the men in your organization, write to the Reading Counsellor, c/o McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York.

* * *

THE McGRAW-HILL NETWORK

23 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,000,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

THE McGRAW-HILL BOOKS

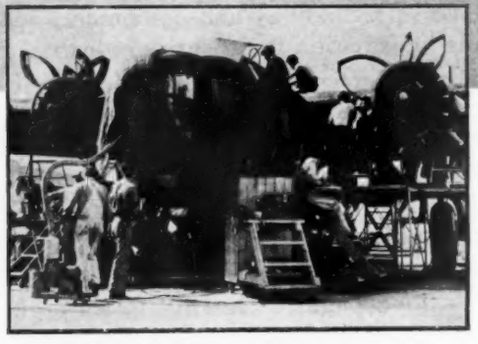
Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

McGRAW-HILL PUBLISHING COMPANY, Inc.
330 WEST 42nd STREET • NEW YORK

THE McGRAW-HILL NETWORK OF INDUSTRIAL PUBLICATIONS

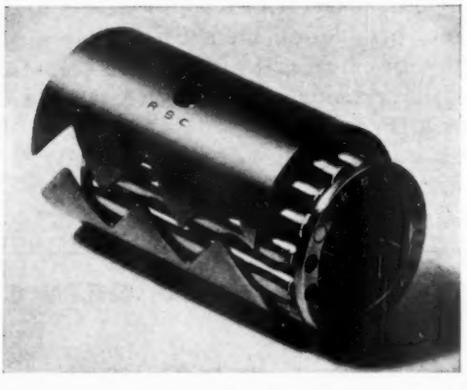
American Machinist
Aviation
Bus Transportation
Business Week
Chemical & Metallurgical Engineering
Coal Age
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical West
Electrical World
Electronics
Engineering & Mining Journal
E. & M. J. Metal and Mineral Markets
Engineering News-Record
Factory Management & Maintenance
*FOOD INDUSTRIES—Shows how to Manage Production, Retain Nutrition and Appetite Appeal.
Mill Supplies
Power
Product Engineering
Textile World
Transit Journal
Wholesaler's Salesman

ROLLER BEARINGS



Step ladders, equipment shelves and air conditioning equipment are quickly and easily moved around planes on Bassick Casters.

To help speed the production end of our total war effort, Bassick Casters are equipped with RBC Standard Duty Roller Bearings. They provide remarkable anti-friction qualities—easy starting and easy rolling—with little maintenance and low cost. If you have a bearing problem, whether it involves a duty such as this caster application or one of heavy radial loads, put it up to RBC engineers.



ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY

DETROIT BROACH

"Follow thru"

ASSURES BETTER PRODUCTION IN BROACHING OPERATIONS

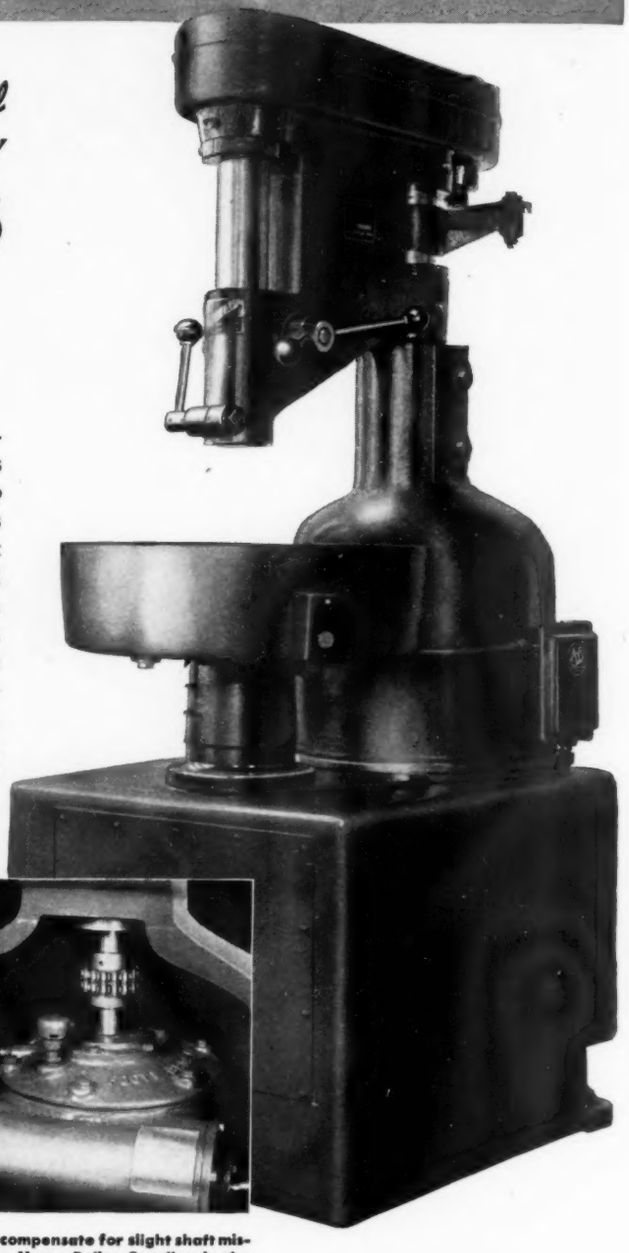
Detroit Broaches must produce! They are designed and manufactured with only that in mind.

However, as in any other production operation, there are times when unforeseen difficulties arise on the job . . . problems that cannot be fully solved by the machine operator or the production executives in his plant. In such cases, a Detroit Broach engineer is immediately available to eliminate whatever trouble has been encountered and to get the job running smoothly. As a broaching "specialist", he knows exactly how the broaches and broaching accessories should function . . . what requirements are necessary prior to broaching . . . how maximum production rates can be secured.

The responsibilities of the Detroit Broach organization end only when the broaches and fixtures produced by the company have done the job for which they were intended.

DETROIT BROACH COMPANY
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

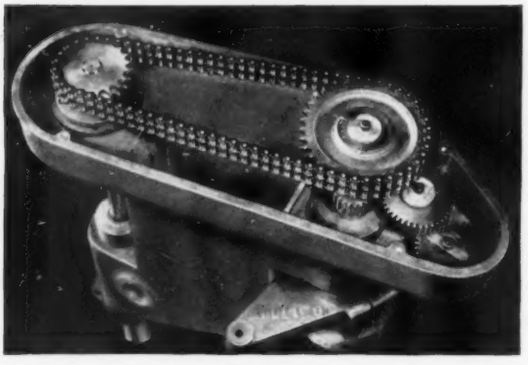
12 Millionths Limits on Famous ULTRA-LAP Machines



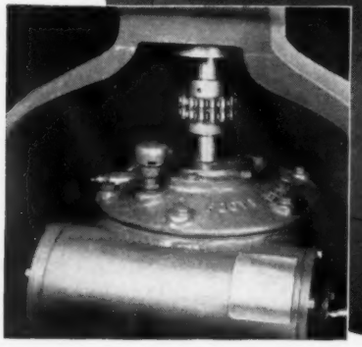
MORSE *"Engineered to the Job"* CHAIN DRIVES

INSURE Positive and Flexible Power Transmission

Thanks to the precision control of Ultra-Lap Machines—lapping or surface finishing of vitally needed war parts can now be put on a production basis, in fact, stepped-up 700% over the slow hand process. ¶Ultra-Lap Machines make practical a degree of flatness of finished parts not possible by any other method. They rapidly produce metal surfaces that are optically flat, within 12 millionths of an inch or one micro-inch R.M.S. for smoothness. ¶Such precision demands unerring power transmission. Morse "Engineered to the Job" Roller Chain Drives and Couplings are doing the work—transmitting power smoothly, economically and at practically 100% efficiency. You, too, can have the benefit of Morse Drive Equipment . . . call your local Morse Representative.



Front spindle of Ultra-Lap Machine is driven with Morse Roller Chain Drive as illustrated above. This drive eliminates any possibility of slip, regardless of load—so important in precision lapping. Note compact design.

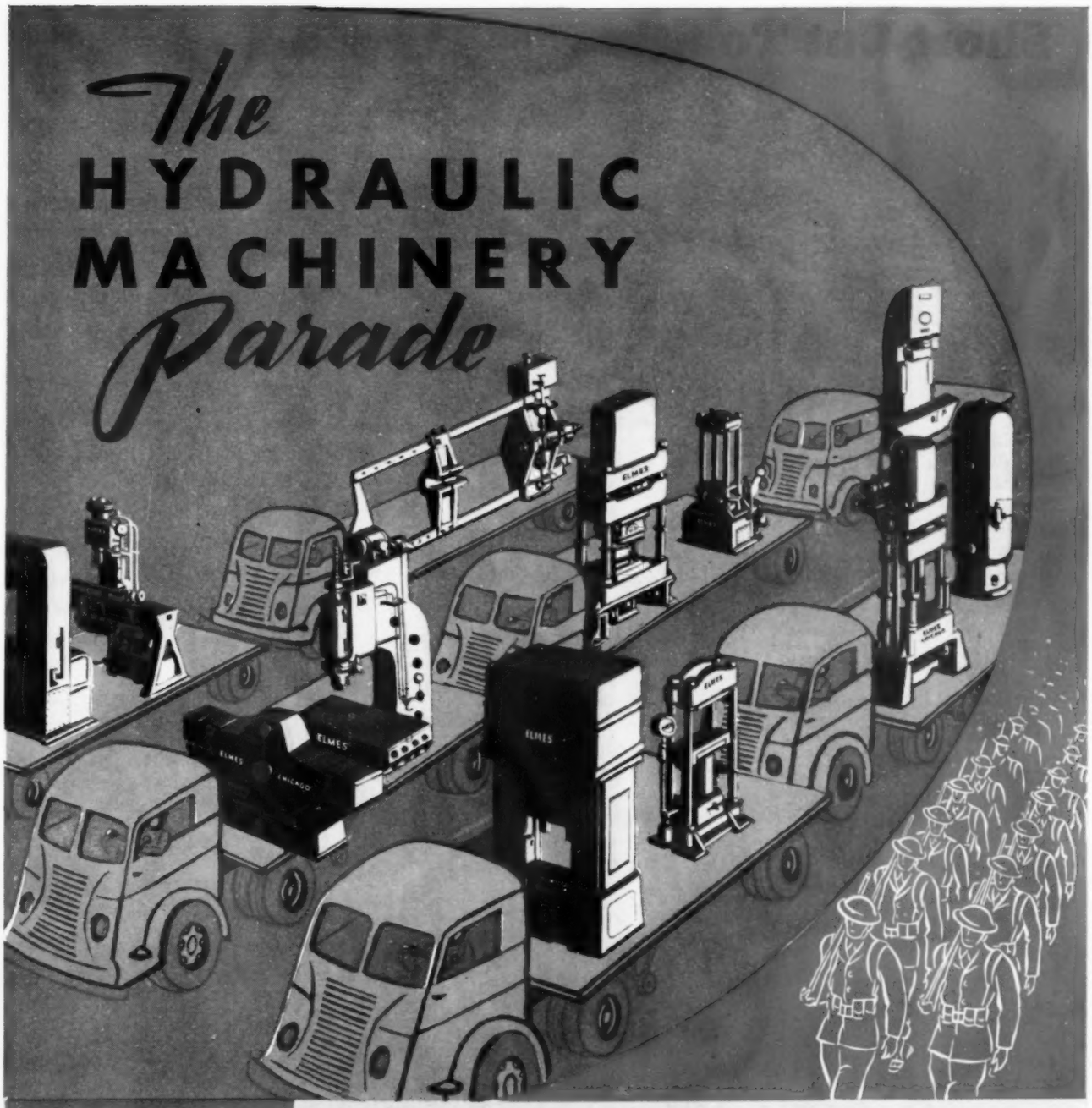


In order to compensate for slight shaft misalignment, a Morse Roller Coupling is the connecting medium between reduction gears and drive shaft.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.



This "parade" is representative of the broad line of Elmes Hydraulic machinery and equipment. Were it possible to load each typical Elmes-built unit on a truck, and assemble those trucks in a single line, such a parade would be several city blocks long. It would include metal working presses, plastic molding presses, extrusion presses, pumps, accumulators, valves and accessories . . . small units and large—suitable for all types of work—equipment for complete hydraulic installations. Write for a copy of the New Elmes Catalog.

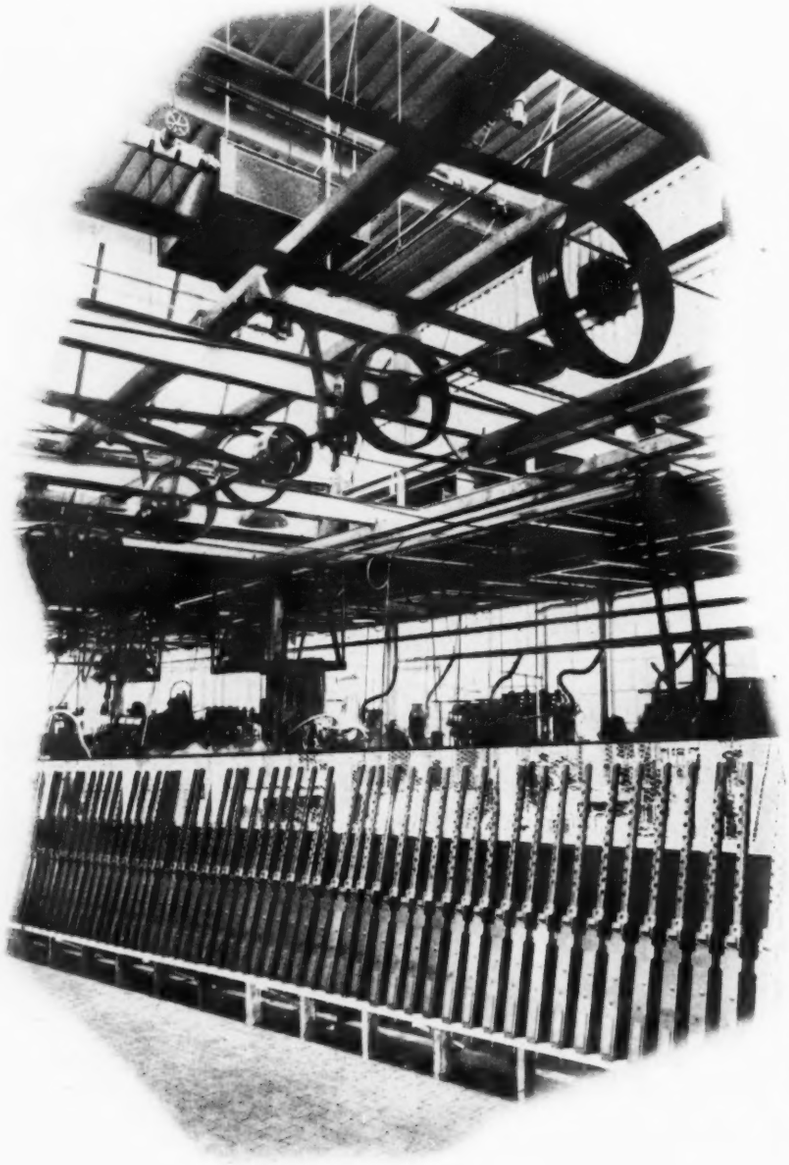
SINCE 1851
Elmes
HAYmarket 0696

CHARLES F. ELMES ENGINEERING WORKS
1001 Fulton St. • Chicago, Illinois

Also Manufactured in Canada:
WILLIAMS & WILSON, Ltd. Montreal & Toronto—*Distributors in Central and Eastern Canada* . . . . GORDON RUSSELL, Ltd., Vancouver, *Distributors in Western Canada*

METAL WORKING PRESSES • PLASTIC MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

Short Cut To Stingers For Uncle Sam's Wasps



Bullets come out of them like water out of a fire hose — 800 a minute. They're 50 Caliber Browning Basic Machine Guns for fighting planes . . .

But their manufacturer faced a delay in production. He had planned individual motor drives on his machines, but he couldn't corral enough motors. And if he got them, installation-time loomed ahead as another delay.

Group drives from lineshafting were the natural solution. And the natural choice for mounting them . . . Fafnir Double Ball Bearing Hanger Boxes from the nearby Fafnir distributor. Fafnirs because they're easiest to install; locked to stock shafts with a simple finger-twist of the Self-Locking Collar. Fafnirs because they pack extra radial and thrust load capacity into their Balanced Design; deeper races, larger balls.

Thus installed, these lineshafts were ready to run "for the duration"; carry maximum power from motor to machine 24 hours a day, with occasional greasings the only attention needed.

Many a defense manufacturer is taking this same road today, at the "Turning Point of increased production". And many have reason to be glad the turning point is behind them . . . the Fafnirs already spinning friction-free in their plants. The Fafnir Bearing Company, New Britain, Connecticut.

"TURNING POINT OF INCREASED PRODUCTION"

FAFNIR
Ball Bearings
THE BALANCED LINE
MOST COMPLETE IN AMERICA

REINFORCEMENTS

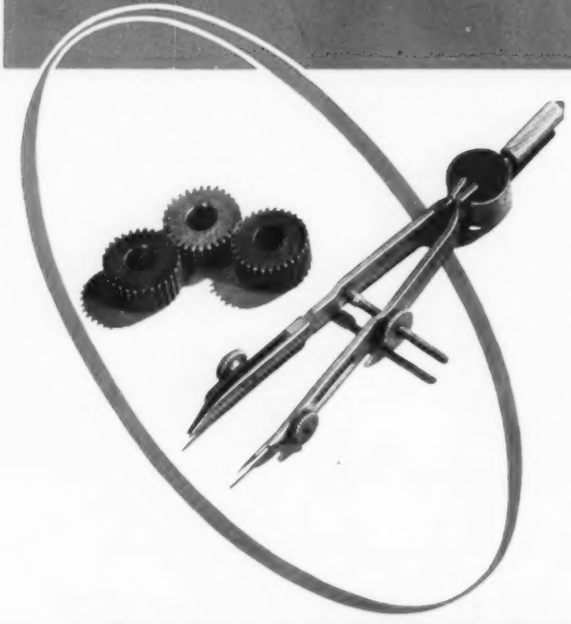
Top quality cutting tools are effectively reinforcing the production drive of industry's machine tool divisions.

MORSE THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

Instrument Gear Backlash -zero



This new Red Ring Rotary Shaving Machine shaves gears for range finders, sighting mechanisms and navigation instruments—gears with a ZERO BACKLASH and remarkably smooth tooth surfaces.

Also, it corrects errors of index, helical angle, tooth profile, and eccentricity. The entire operation takes only from 8 to 48 seconds per gear.

This is a vertical machine with full automatic control which offers full visibility of the work at all times and makes it extremely easy for the operator to load and unload without endangering either the work or the cutter.

If you are making instrument gears, write for the new bulletin on the GCL-3 Rotary Gear Shaving Machine.

NATIONAL BROACH AND MACHINE CO.
RED RING PRODUCTS
5600 ST. JEAN · DETROIT, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

This Simple Test Shows *Why the* CONCAVE SIDE *Cuts Belt Costs!*

What Happens When a V-Belt Bends

FIG. 1

FIG. 2

If you care about belt costs, pick up any V-belt you have handy and make this simple test:—

Bend the V-belt while you grip its sides and you will feel how the belt changes shape. The top, under tension, narrows. The bottom widens. The sides of the belt bulge out. Clearly, if its sides were straight to begin with, the bent belt is forced into a shape that does not fit the sheave groove—as shown in figure 1, on the left.

Now, bend a V-belt built with the patented Concave side. You get the same shape change, but now the new shape exactly fits the sheave groove—as shown in figure 2. There is no side-bulge. Results? (1) Uniform side-wall wear—longer life! (2) The belt gets a full side-width grip on the pulley—carries heavier loads without slippage. This cuts belt costs and saves power.

Only belts built by Gates are built with the Concave side, which is a Gates patent.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

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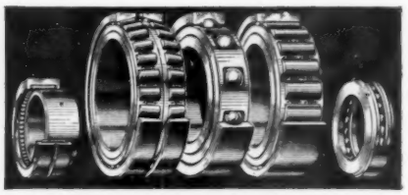
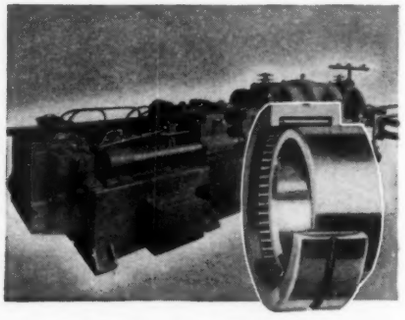
IN THE NEWS
WITH BANTAM BEARINGS

ON THE 1000-POUND LANDING GEAR of many giant bombers, you will find Bantam Needle Bearings contributing to smooth, dependable operation of the "Up-Latch" which locks the gear in flight position. This is just one of the ways that the many types of Bantam Bearings are helping to assure the successful functioning both of the weapons for Victory and of the machines that produce them.

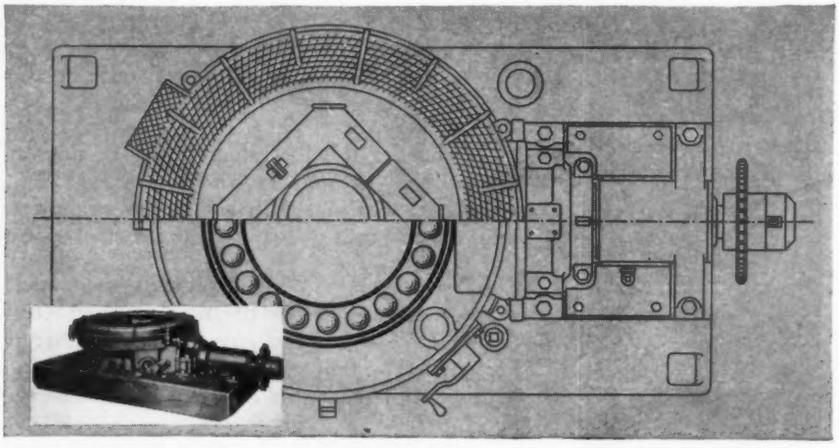


BANTAM'S ENGINEERING COOPERATION is especially valuable in meeting new and unusual requirements. Bantam makes every major type of anti-friction bearing—straight roller, tapered roller, needle, and ball. Bantam engineers aid in the selection of the most suitable type, or design special bearings to meet your requirements. If you have a difficult bearing problem, TURN TO BANTAM.



SPEED AND ACCURACY characterize the operation of centerless bar turners built by The Medart Company and used for precision finishing of bars and tubular products. In an ingenious feeding device combining hydraulic and mechanical action, standard Bantam Quill Bearings serve a novel application in cam rollers on the feeding grip jaws.

RIGID LABORATORY CONTROL contributes to the successful performance of Bantam Quill Bearings—the unusual anti-friction bearings that combine high radial load capacity, small size, ease of installation and lubrication. Samples from daily production runs are regularly tested for adherence to metallurgical and machining specifications. For further information on the Quill Bearing, write for Bulletin D-104.



OIL FOR A WAR OF MACHINES is needed in ever-increasing quantities—and the drill bits are turning faster, boring deeper into the earth. This cut-away view shows one of The Wheland Company's High-speed Oil Bath Rotaries, designed to meet every requirement of present-day drilling practice—and large Bantam Precision Ball Bearings are used to take both thrust and radial loads on the rotary table.

BANTAM BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

BANTAM BEARINGS CORPORATION • SOUTH BEND • INDIANA

WELLS SAWS get things done!

When it comes to fast, accurate metal cutting

Big jobs or little jobs — tool steel or aluminum — production or maintenance work — whatever your metal cutting requirements, a Wells Saw will help you get things done.

With the new, more capable V-12 you can apply the principle of continuous cutting to the bigger jobs — up to 13 in. by 16 in. rectangular or 13 in. diameter round. The model 80 saw too, is an improved unit — redesigned for ruggedness and ability.

Put a Wells Saw to work in your plant now — you can get one quickly from your mill supply dealer or write direct.

Wells Has Established Leadership

SERIES 80

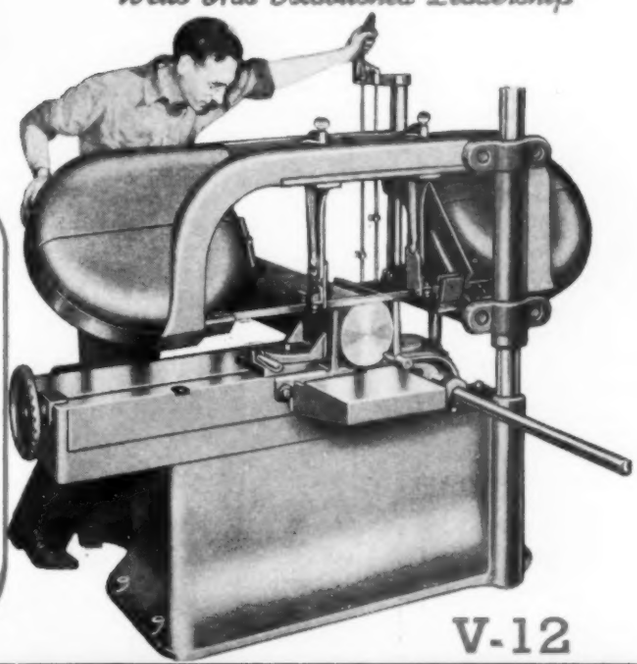
Wells SAWS — THE SIGN OF SERVICE

SPECIFICATIONS
SERIES 80 METAL SAW

Capacity: Rectangle	8" x 16"
(spec. bowed guides)	5" x 24"
Rounds	8" dia.
Speeds: ft. per min.	60, 90, 130
Motor	Specifications optional

V-12 METAL SAW

Capacity: Rectangle	13" x 16"
Round	13" dia.
Speeds: ft. per min.	50, 90, 150
Guides	Adjustable
Feed	Hydraulic-Controlled
Vise	New quick acting type
Motor	Specifications optional



V-12

WELLS MANUFACTURING CORPORATION

Wells METAL CUTTING BAND SAWS

606 ADAMS STREET • THREE RIVERS, MICHIGAN

8 ways to keep your FORD Triblocs rolling for the duration

Because steel is so critical to America now, it is up to every one of us to make our present equipment last longer. That means proper maintenance. Here are **8** things to do to keep your **FORD TRIBLOCS** in efficient working order:

1. **Keep equipment well lubricated and in good repair.**
2. **Don't exceed rated capacity.**
3. **Inspect chain periodically and change when wear becomes excessive.**
4. **Don't make lifts or pulls for which hoist was not designed or intended.**
5. **Avoid dropping hoists or throwing chain carelessly.**
6. **Replace straightened hooks.**
7. **Be sure the hoist has the capacity and characteristics necessary for the job.**
8. **Proper hoist selection saves production time and lengthens hoist life.**

Write for information on **FORD TRIBLOCS.** They range in capacities from ¼ ton to 40 tons. They are available to all who have adequate priority rating.

Order from your distributor

FORD CHAIN BLOCK DIVISION

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In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

The Final Touch of Filing Perfection

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. . . because these Swiss-Pattern tools of precision are available in all types and sizes required for accurate or intricate work.

. . . because they are always uniform in hardness, keenness, and all-around perfection.

. . . and because their long-maintained sharpness of teeth assures greatest filing economy.

Essential in every war industry . . . preferred by tool and die makers and machinists for over 40 years.

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FILES ONLY THE BEST ARE GOOD ENOUGH TOOLS

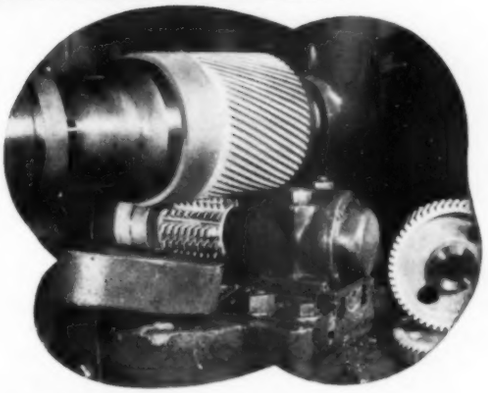
American Swiss File & Tool Co., Elizabeth, N.J.

AMERICAN SWISS FILES *of Precision*

'43 MODEL!

STRIPPED of all ornament and facilities for comfort, the scout car is just about the toughest thing on rubber. Yet even the scout car is only as strong as its weakest part.

Good parts are the product of good tools. National cutting tools are tools of character, built for hard use, long life, exacting precision.



NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
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COUNTERBORES
SPECIAL TOOLS

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HOME OFFICE AND FACTORY—DETROIT, MICH.

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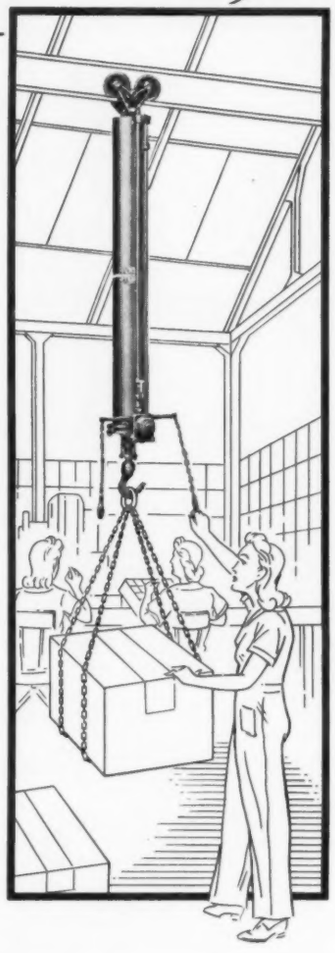
Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

Where Women are Employed In Industry

Reduce Fatigue... Make Lifting Easy WITH CURTIS AIR HOISTS



If you are considering employing more women in your plant, you can convert most manual lifting operations, make tough jobs easy, and speed up your output with Curtis Air Powered Hoists.

Many heavy lifting jobs, formerly requiring male labor, may now be accomplished quickly and easily by women, using Curtis equipment.

Curtis Air Hoists provide these important advantages:

- Smooth, fast, accurate control of loads
- Low first cost — lowest operating expense
- Light weight — pendant, bracketed, or rope compounded types
- Immunity to abuse or overloads
- One-man or woman operation — finger-tip control
- Do not require skilled labor.

Hundreds of war production plants have increased production efficiency, reduced worker fatigue, saved thousands of man-hours by solving many material hoisting problems with Curtis equipment. Write for full information and free booklet, "How Air Power Is Being Used in Your Industry."

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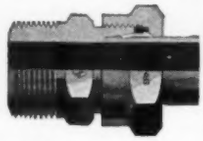
Get.. SPEED SIMPLICITY SATISFACTION

with WEATHERHEAD FITTINGS AND HOSE

Weatherhead fittings and hose assemblies are engineered to meet the war-time demand for speed—for simplicity of installation—and satisfaction in performance.

ERMETO SAFETY FITTINGS—A modern method of connecting tubing that eliminates flaring, threading, welding or soldering. Suitable for any type of metal tubing, and since thin walled tubing may be used, reduces the amount of material required. *Ermeto Fittings hold up beyond the burst strength of the tube itself* and withstand excessive vibration without leakage of the joint.



BRASS TUBE FITTINGS—Quality tube service parts for small diameter tubing—a complete range of fittings in patented inverted, S. A. E., and compression types.

FLEXIBLE HOSE ASSEMBLIES AND FITTINGS
Non-metallic flexible hose for automotive, aviation and machine uses. Oil-proof and gasoline-proof. Weatherhead complete hose assemblies with fittings attached are quickly and easily installed for high pressure fuel, gas, air and hydraulic application.
We also manufacture low pressure hose which is furnished in any length with necessary fittings.

PACKLESS VALVES—An advanced product of Weatherhead engineering, these valves have only four working parts. Tested through 100,000 on and off cycles, Weatherhead packless valves are leak-proof, quick acting and extremely rugged in construction. Compact design, trim appearance, and low overall height provide attractiveness of installation.
Tell us the Weatherhead products in which you are interested and we'll send complete details.

THE WEATHERHEAD CO. • CLEVELAND, OHIO

WEATHERHEAD

TUBE FITTINGS • FLEXIBLE HOSE • VALVES • DRAIN COCKS
AVIATION, AUTOMOTIVE AND REFRIGERATION SPECIALTIES

you TWIRL 'em

Quality—PLUS

Knurling is the "PLUS"—the "something added" which you get in "UNBRAKO." It prevents slipping, allows the fingers—handiest of wrenches—to be used to best advantage. Saves precious TIME. Besides these unique knurling advantages, "UNBRAKO" represents the maximum quality attained in a screw—strength, precision. And you pay no more for "UNBRAKO" than ordinary cap screws. Write for Catalog.

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SOCKET HEAD CAP SCREWS

Sizes from No. 4 to 1½" diameter.

The knurling of Socket Screws originated with "UNBRAKO" years ago.

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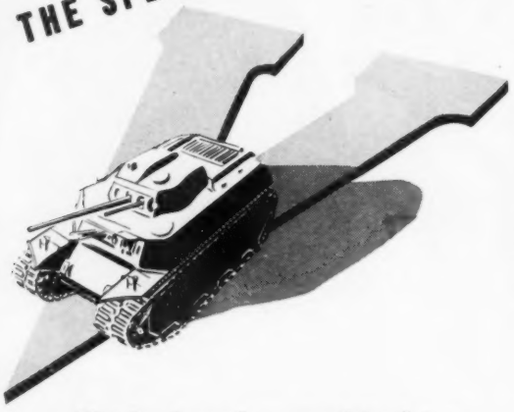
Metal Shapes-

THE SPEARHEAD OF VICTORY



Metals, forged or machined into countless shapes, make up the hard-hitting weapons with which America fights. The parts used in today's war implements are fabulous in number—highly complicated, unbelievably rugged, extraordinarily precise.

RITCO is proud to supply such parts to the full extent of its facilities. With over a century's experience in metal working, this company has solved many a knotty production problem . . . and welcomes them today.

SPECIAL BOLTS, NUTS AND STUDS
DROP FORGING AND DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
SPRAYED METAL SERVICE

Estimates gladly submitted.
Send samples or blueprints.
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148 West River St., Providence, Rhode Island
Serving American Industry Since 1834

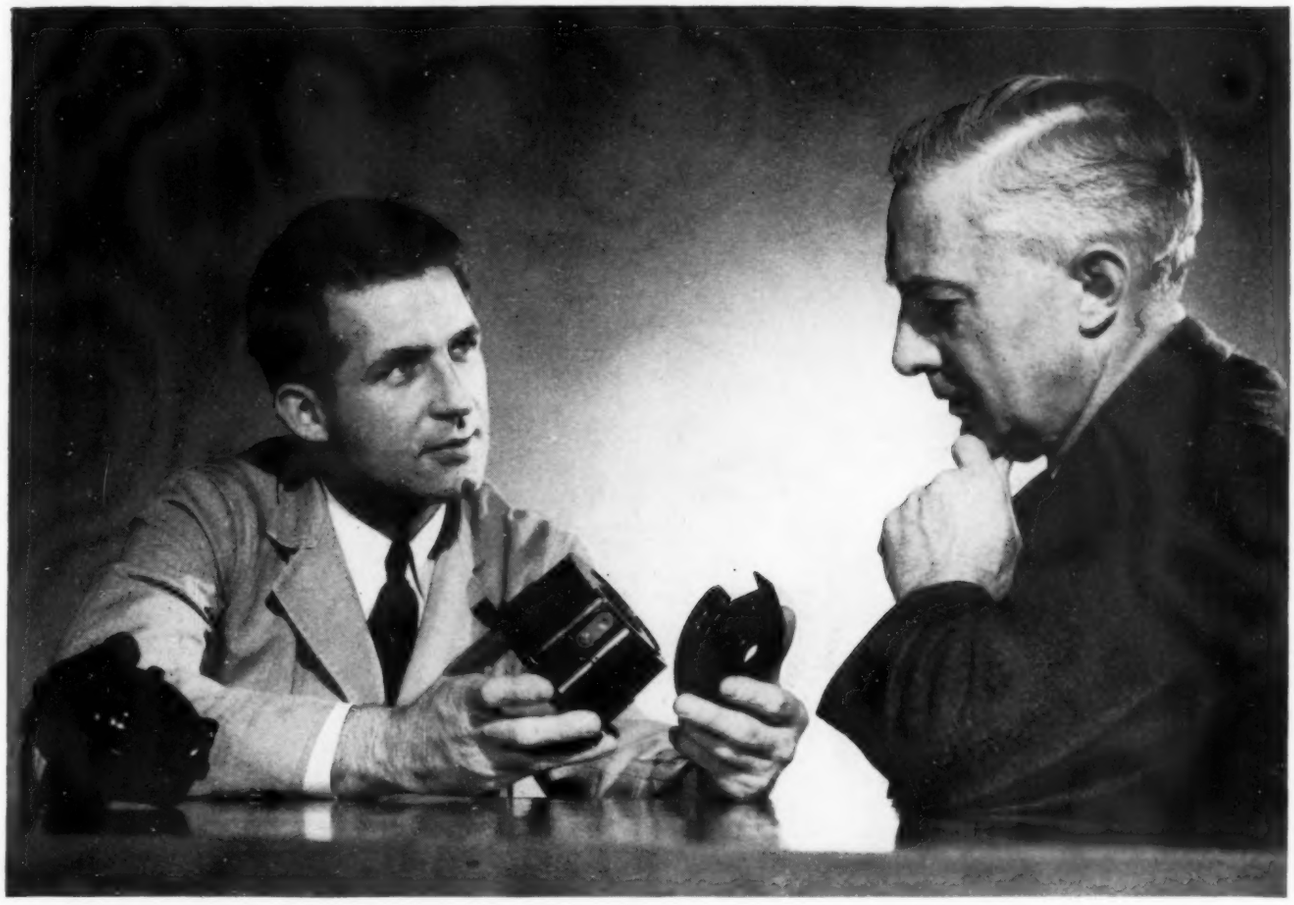
RITCO

Today, when the Time element is so vital that it is measured in *minutes* rather than in hours, the 3-mile-a-minute speed of AIR EXPRESS is proving a "life-saver" in the Battles of Production and Delivery.

You do not need a priority to ship by AIR EXPRESS, but if you have war production shipments requiring priorities, they will be granted. Phone Railway Express Agency, AIR EXPRESS DIVISION, or any air line.

NOW IN ITS 16th YEAR
AIR EXPRESS
Division of RAILWAY EXPRESS

In a Change-over to *Plastics*

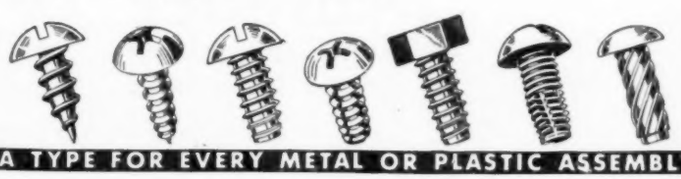


—YOU CAN SOLVE YOUR FASTENING PROBLEMS SIMPLY AND QUICKLY!

Call in a Parker-Kalon Assembly Engineer!

When you start "ironing out" the assembly problems in your change-over to plastics, *Parker-Kalon can help you!* Parker-Kalon Assembly Engineers have shown you how to *save time and labor* on all types of metal assembly with Self-tapping Screws – AND, their knowledge and experience *with plastics* will be just as valuable to you.

They can show you how the right type of Parker-Kalon Self-tapping Screw can make fastenings to plastics quicker and easier than by any other fastening method. They can help you put P-K Screws to work on your assembly line without costly delays – for, no skilled hands or special tools are required. Get the *most* out of your switch to plastics – call in a Parker-Kalon Assembly Engineer, now! Write Parker-Kalon Corporation, 192-200 Varick Street, New York, N. Y.



A TYPE FOR EVERY METAL OR PLASTIC ASSEMBLY

There's a P-K Self-tapping Screw for Every Type of Plastic Assembly

Whether your particular job requires a *thread-cutting* or *thread-forming* screw, there's a P-K Self-tapping Screw that will speed up your assembly by eliminating tapping operations or the use of tapped inserts. And, the correct type of P-K Screw will give you a BETTER as well as cheaper means of assembly. Remember, too, that the Parker-Kalon Quality-Control Laboratory – without counterpart in the screw-making industry – assures consistently reliable performance. "Doubtful screws" – screws that *look* all right but some of which fail to *work* right – are eliminated.

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

Give the Green Light to War Assemblies

WE'RE SMASHING BOTTLENECKS

...IN MATERIALS HANDLING

with the CM METEOR heavy-duty ELECTRIC HOIST

½ Ton and Up

The *new* CM Meteor heavy-duty wire rope electric hoist is industry's newest recruit for speeding-up production. It is designed, engineered and built to answer the nation-wide demand to produce more and faster. Featuring true balance, streamlined design...aeroplane type cooling...helical gears and one point lubrication, the CM Meteor provides fast materials handling with complete safety. Compact...low head room ...readily adaptable to present systems. Only 110 volts pass through the push button station. The Meteor really *smashes* bottlenecks by speeding up materials handling.

Completely illustrated engineering Catalog No. 142 in color, showing details, specifications, applications and point by point advantages of the CM Meteor will be sent on request. Write:

CHISHOLM-MOORE HOIST CORPORATION

(Division of Columbus-McKinnon Chain Corp.)

120 FREMONT AVE. TONAWANDA, N. Y.

Branch Offices: NEW YORK • CHICAGO • CLEVELAND

are your hose lines MANTRAPS?

NEW SCHRADER HOSE REELS MAKE HOSE BEHAVE

Get your factory airlines out of the way with Schrader Hose Reels . . . no fumbling, no picking up hose off the floor. Installations keep the hose always conveniently at hand to speed work and reduce effort. When pulled out, the hose stays out until it is deliberately released — the same action as a window shade.

SAVES RUBBER, TOO

Schrader Reels protect valuable rubber. They keep the hose safely reeled where it will not be cut, walked on, or run over.

EASY TO INSTALL

Schrader Reels may be installed against the wall, at bench side, under the bench, or overhead. Tuck-Away type No. 2400 has 12 feet of hose; No. 2401 has 18 feet. Also made in drum and open types — hose lengths 25 to 50 feet.

For complete information about Schrader Hose Reels write for new catalog insert sheet No. 13A or for a complete copy of Catalog No. 10.

Schrader

REG. U.S. PAT. OFF.

AIR VALVES, GUNS, FITTINGS AND MACHINE CONTROLS

A. SCHRADER'S SON BROOKLYN, N. Y.

Division of Scovill Manufacturing Company, Incorporated

early delivery

MOREY 8" VERTICAL SHAPER

EQUALLY EFFICIENT IN YOUR TOOL ROOM OR MANUFACTURING DEPARTMENT

features

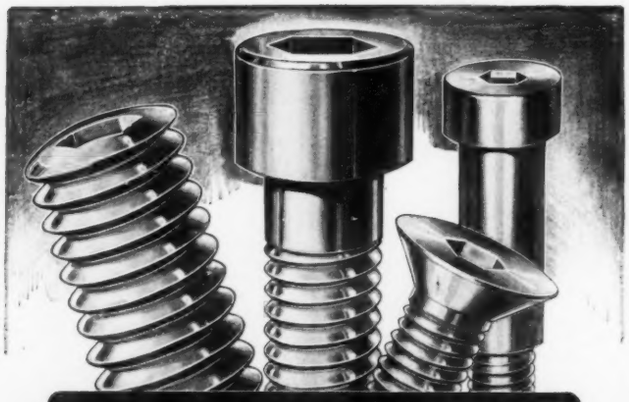
Precision . . . Easily handled—your operators will appreciate it . . . **Cutting Stroke** changed quickly . . . **Feeds** varied instantly . . . **Power** rapid traverse in all directions . . . **Brake** for ram automatically applied . . . **Bijur Lubrication** . . . **Timken Bearings**—Bull gear mounted on Timken Bearings. Roller table mounted on Timken Bearings . . . **Modern Design**—built to the highest standards of workmanship and materials—simplified operation, powerful yet finger-tip control . . .

Also built in 12" and 14" sizes

DESIGNED AND BUILT BY **MOREY MACHINERY CO., INC.**

Ask for Circular No. 726

410 BROOME STREET NEW YORK, N.Y.



ALLENS' QUALITY PERSISTS

IT STAYS on the level of our all-time *high* in strength of material, thoroughness of heat-treating, accuracy of threading. Not one characteristic of Allen screws has changed except for the better.

Production-gains have *all* been scored by improved manufacturing processes; not in a single case by cheapening the product.

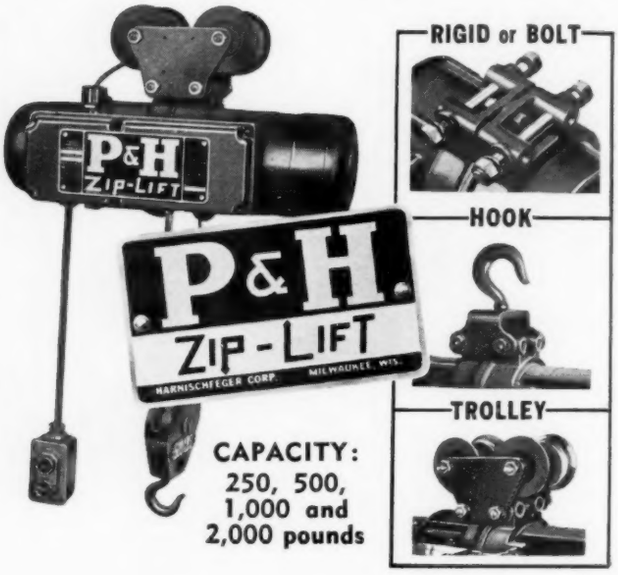
Step-by-step inspection standards have been *more* intensively applied, not less. So that everything "Allens" have had they have NOW. And every quality that's won your preference will continue to *hold* it.

Order only through your local Allen Distributor — the man who gets you the goods to the LIMIT of the supply!

THE ALLEN MFG. COMPANY
HARTFORD, CONNECTICUT, U. S. A.

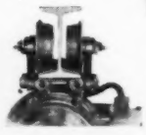
CONVERTED IN A FEW MINUTES

with any of these 3 mountings



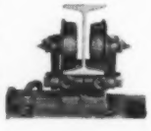
● Do you face the war-time need of converting your hoists for other services? The interchangeable mountings of P&H Zip-Lifts require but a few minutes to change to any of the three mountings shown — merely loosen two bolts. All mountings are jig-drilled to identical centers to assure a firm, safe attachment, free from wobble.

In the interests of speeding war materials handling, consult P&H Field Representatives on every hoisting problem. Zip-Lift users will find their counsel especially helpful in planning more flexible and efficient hoisting facilities.



PARALLEL OR CROSS-MOUNTED

in addition to quick interchange of type of suspension, P&H Zip-Lifts are also easily mounted with hoisting drum either parallel or horizontal to runway beam. This provides widest latitude of pull in the direction desired.



General Offices: 4514 W. National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION
HOISTS · WELDING ELECTRODES · MOTORS P&H EXCAVATORS · ELECTRIC CRANES · ARC WELDERS

TOOL INVENTORY SLASHED WITH McCASKEY CONTROL

"Controlling Tool Issue and Use, Springfield Armory, Springfield, Mass.", an article in a recent issue of Factory Management and Maintenance, outlines several steps taken to conserve tools and productivo time. A few brief extracts contain valuable suggestions for other plants engaged in war work.

"Tool Control At the Armory consists of maintaining proper inventories, tool responsibility, and tool improvement. To obtain these factors, we make full use of a standard system of tool control altered slightly to meet our particular requirements.

"When this system was first installed, our total inventory was approximately 38,500 tools. After three months, this inventory had been reduced to 15,000 tools. Loss of productive time by personnel going from one department to another to find some particular tool also has been eliminated.

"The activity record gave us a yardstick by which we could measure the amount of work in each crib and on each shift, enabling us to employ our personnel to best advantage."

TOOL RESPONSIBILITY FIXED FOR THREE SHIFTS

"To obtain a tool, a man must make out a tool loan order form. Thus we know who has drawn the tool and who is responsible for it. The man who drew the tool knows he signed for it and is held responsible for it. He will see that it is returned to the crib. Our experience has definitely proved this statement.

"We do not necessarily have the man who drew the tool return it. Anyone may return it, but he must initial the pink copy. He then secures the original copy of the tool loan order slip and posts it in a clip on the machine. This enables the man who originally obtained the tool to destroy his own receipt, even though he may be on another shift. We find that the men working on the machine on each of the three shifts willingly cooperate with one another for mutual protection."

Space limitations prevent an account of how breakage has been reduced and "considerable information gained about problems in the shop that otherwise would have been secured only after a thorough investigation."

WRITE FOR

Reprint of complete article and similar reports of the experiences of several representative plants with McCaskey Tool Crib Control.

SENT FREE ON REQUEST

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

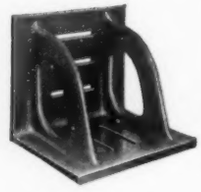
McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Waterford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

For reliable inspection

PRECISION
SURFACE PLATES ANGLES AND CUBES



Made of Meehanite—an unusual wear-resistant material of dense, uniform grain structure—that assures a smooth, flawless surface.

The surface plates have an extra heavy top supported by scientifically designed ribs which give the plates absolute rigidity and extra strength to the entire surface —from the center to the very edge. Ample clamping space is provided.

The angles and cubes are made of the same material with the same precision.

Send for folder giving complete information regarding sizes and prices.

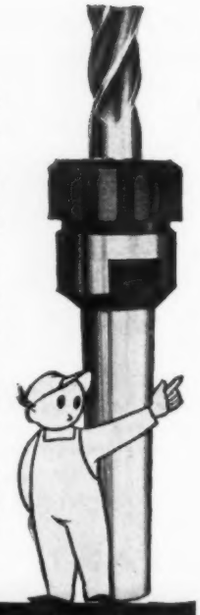
MACHINE PRODUCTS CORP.
6769 McNichols Road • Detroit, Michigan

UNIVERSAL FIRST COMPANY IN AMERICA TO WIN COVETED 20% BOND FLAG

When each of the 550 of us here at Universal helped give the Allied cause a boost by being America's first industrial plant to subscribe 20% for War Bonds we were mighty proud.

But we're even more proud of the big volume of precision built collet chucks we're turning out daily to help America's arms production.

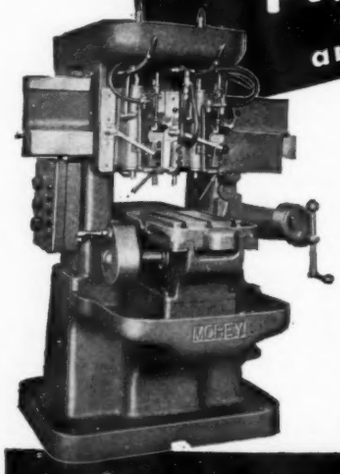
The Universal collet chuck shown here has ground threads, ample room for tool feed out and is ideal for holding end mills, keyway cutters, drills, etc. Write for facts.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

Preloaded Precision Bearings for Spindles

MOREY 12M
HIGH-SPEED VERTICAL PROFILER and MILLER



Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.

"Commercial"
ANNULAR BALL BEARINGS

ACCURATE

STRONG

STURDY

SPECIALLY DESIGNED FOR SPECIAL SERVICE

WE have the skill, knowledge and experience necessary for manufacturing many different types of ball bearings such as we illustrate on this page.

"Commercial" Annular Ball Bearings are used in widely diversified products—cultivating machines, typewriters, textile machinery, radios, scales, coal mine conveyors and other uses too numerous to mention.

SCHATZ **"Commercial"** Ball Bearings are famous for uniformly good workmanship, load capacity and endurance. Send for latest catalog.

BALL BEARINGS FOR EVERY PURPOSE

THE SCHATZ MANUFACTURING CO.
U. S. A.

REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Chicago: 902 S. Wabash Ave.
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Why 3 Types of Surface Plates

	SIZES	APP. WEIGHT	BEARING SURFACE	TOLERANCE
A	24 x 36	450	20 - 25	.0001
B	24 x 36	450	12 - 15	.0003
C	24 x 36	450	6 - 8	.001

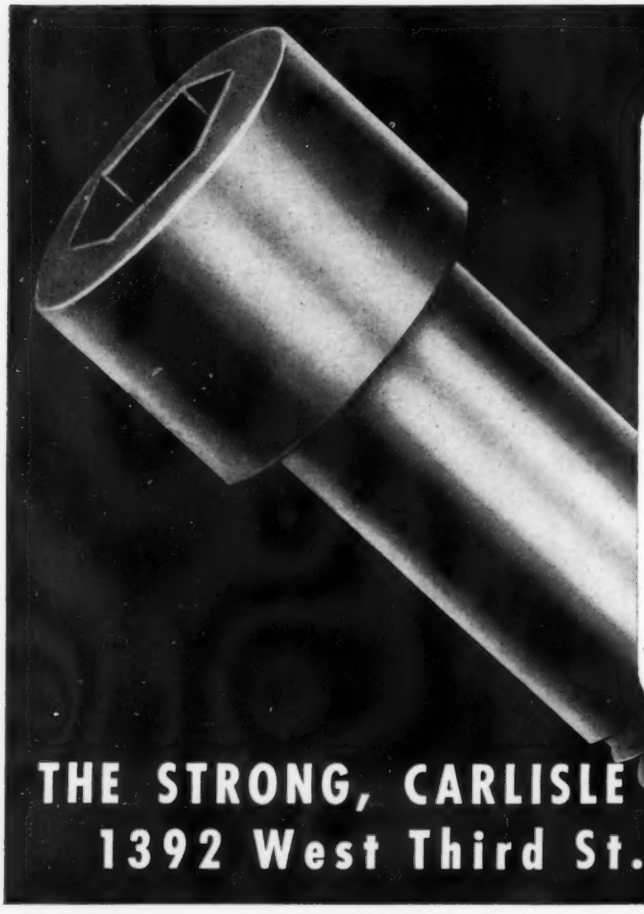
Because — only in having three different tolerances can we supply you with the economically efficient plate best suited for your needs.

A — MASTER ACCURATE SURFACE PLATES
Note the extreme accuracy and .0001 - .0002 tolerance and 20 - 25 bearings per square inch, constant in all sizes from 14 x 18 to 48 x 96.

B — ACCURATE SURFACE PLATES
Same weight, size and famous 3 point suspension as in type A. The .0003 - .0004 tolerance and 12 - 15 bearings per square inch are constant in all sizes.

C — SURFACE PLATES
Same as A & B except hand scraping is not carried so far. Has .001 - .0015 tolerance and 6 - 8 bearings per square inch. Planer finish plates also available.

LOMBARD GOVERNOR CORPORATION
200 MAIN ST., ASHLAND, MASS., U. S. A.

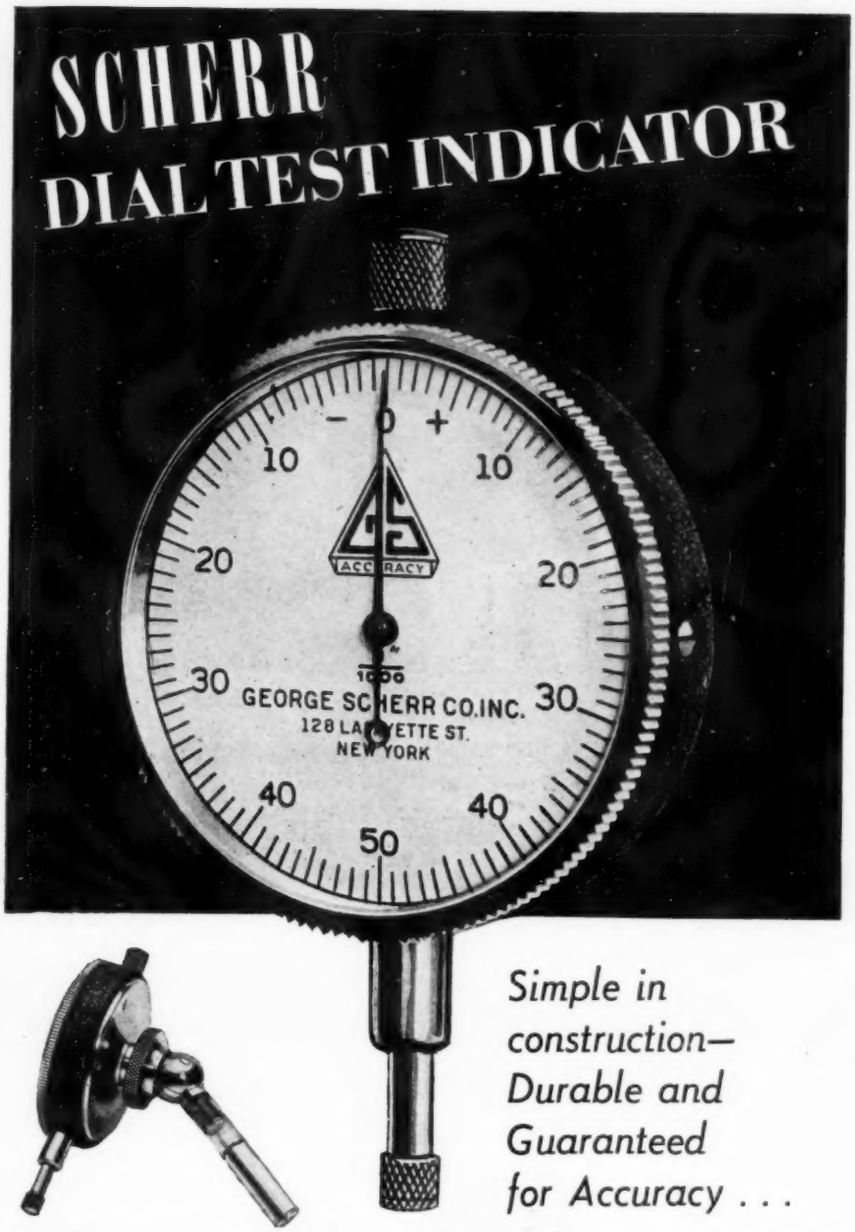


For
PRECISION • STRENGTH
SPECIFY MAC-ITS

Mac-its are heat treated to multiply the strength of every ounce of steel used in them. Designs that take advantage of these stronger screws save man-hours, machine-hours and metals.

THE STRONG, CARLISLE & HAMMOND COMPANY
1392 West Third St., Cleveland • Ohio

SCHERR DIAL TEST INDICATOR

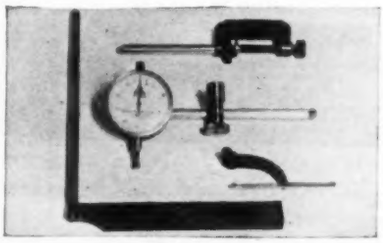


Simple in construction— Durable and Guaranteed for Accuracy . . .

Available with universal back having ball joint which permits wide range of indicator settings. Can be clamped in any position. Simplifies reaching of inaccessible work.

SPECIFICATIONS

Diameter of housing—2"
Thickness 7/16"
Stem diameter—.275"
Plunger travel—3/16"
Dial graduated in 1/1000"—0-50-0



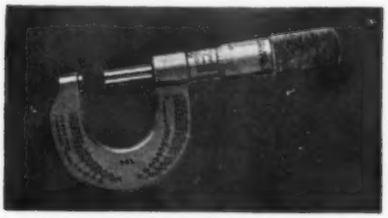
Attachments for Dial Test Indicator greatly extend its utility.

This improved instrument, developed by specialists in precision measuring, offers unique features which assure greater accuracy, minimize friction and reduce the chance of error. Simple in construction, with but three moving parts, the GS Dial Test Indicator can be depended on for long service and maintained accuracy. Features include:

- . . . rotating adjustable dial for zero setting with positive lock nut.
- . . . case and plunger housing machined in one piece from nickel silver casting.
- . . . movement mounted between separate top and bottom plate.
- . . . dustproof case and rustproof mechanism.
- . . . non-breakale crystal.

Write for illustrated bulletin giving detailed information on the Scherr Dial Test Indicator. Write, wire or telephone (Canal 6-1464) for quotations and delivery dates.

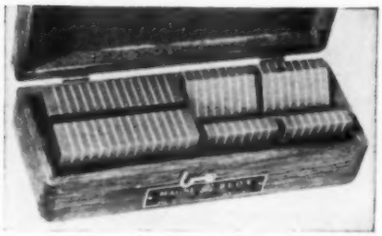
SCHERR MACHINISTS' TOOL SPECIALTIES



Reed Micrometers assure accuracy over full range of screw. Easy to read, smooth and sensitive. Made in several types.

Machinists Tools—available in a wide range of types for all kinds of precision measuring.

Tool Chests—lightweight, strong and durable; separate locks for open top and drawer sections.



Grinding Room Specialties

Magna-Blox—laminated magnetic parallels and V blocks for holding work that cannot be placed directly on magnetic chuck. Practical and economical to use.

"Little Wonder" Radius Dresser — makes possible fast and accurate dressing of convex or concave wheels from 0 to 1" without removing wheel guard.

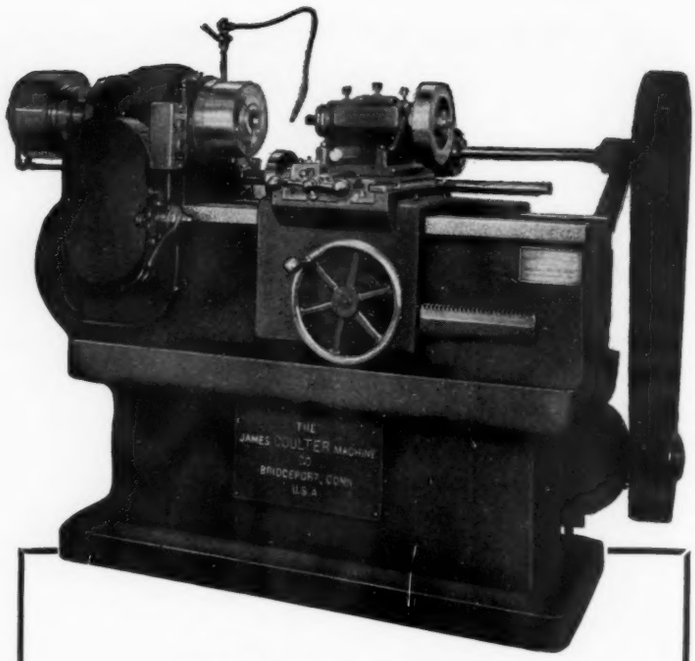
GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

WILLARD *Spring* TOOL HOLDERS

...modern aids to speeded-up war production!

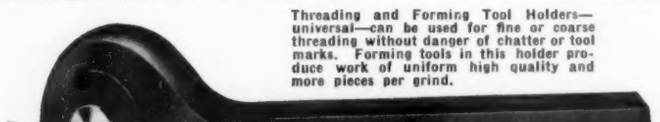
These time and work-saving tool holders are especially adapted to repetitive, fast, precision production work. Their ever-widening acceptance in plants busily engaged in war work is outstanding recognition of their ability to eliminate chatter and protect cutters from breaking as well as to insure against damaged work.

WILLARD TOOL HOLDERS are available for every cutter need. Prompt deliveries.

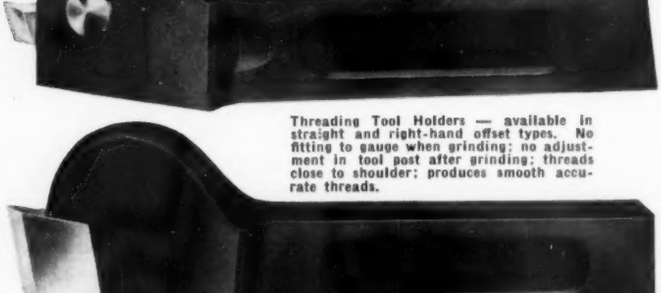
INVESTIGATE TODAY

for ALL SERVICES

Forming Tool Holders, Threading Tool Holders, Cutting-off Tool Holders, Threading and Forming Tool Holders.



Threading and Forming Tool Holders—universal—can be used for fine or coarse threading without danger of chatter or tool marks. Forming tools in this holder produce work of uniform high quality and more pieces per grind.



Threading Tool Holders — available in straight and right-hand offset types. No fitting to gauge when grinding; no adjustment in tool post after grinding; threads close to shoulder; produces smooth accurate threads.

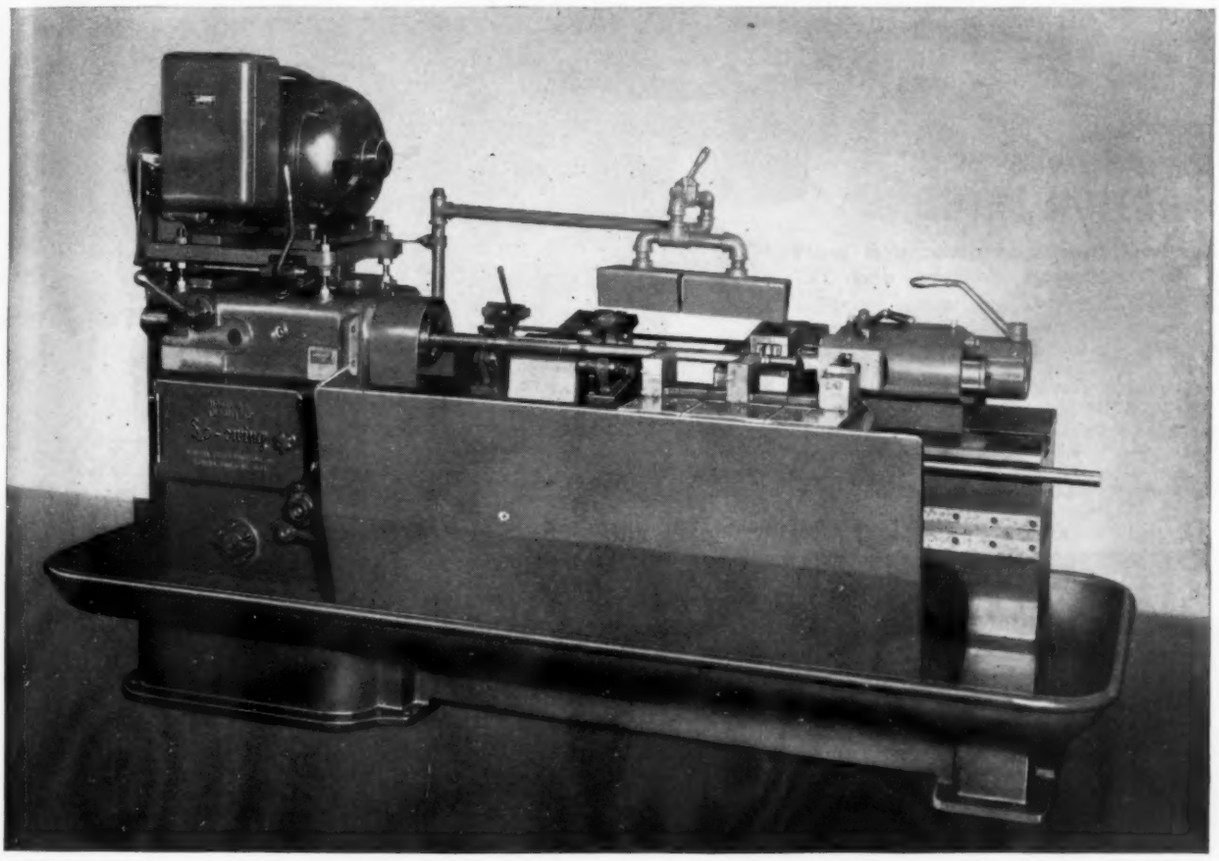
Product of AUTO-ORDNANCE CORPORATION

Thompson

1437 Railroad Ave., BRIDGEPORT, CONN.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK

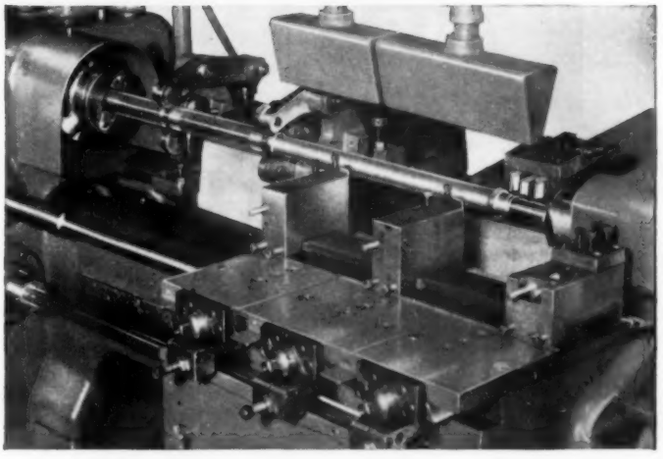


MODEL LR *Lo-swing* LATHE EQUIPPED FOR TURNING LONG, SLENDER SHAFTS

Problem: **To provide a fully automatic Lathe capable of turning long, slender tubes with sintered carbide tools.**

Solution: **In order to reduce the number of tools in contact with the work to a minimum and thus avoid distortion of the tube, this job required a machine with a specially long carriage feed.**

A Model LR Lo-swing was selected for this job and equipped with a special longitudinal feed attachment permitting a maximum carriage travel of 9" which was in excess of that required for this job. The tube is held between centers and driven with a Seneca Falls Automatic Driver which assures a positive balanced drive and also prevents distortion. The work is supported with two-roller steady rests, the rolls of which are in contact with two ground spottings. One-half of the shaft is turned as shown in illustration, after which the shaft is reversed and the opposite end turned.



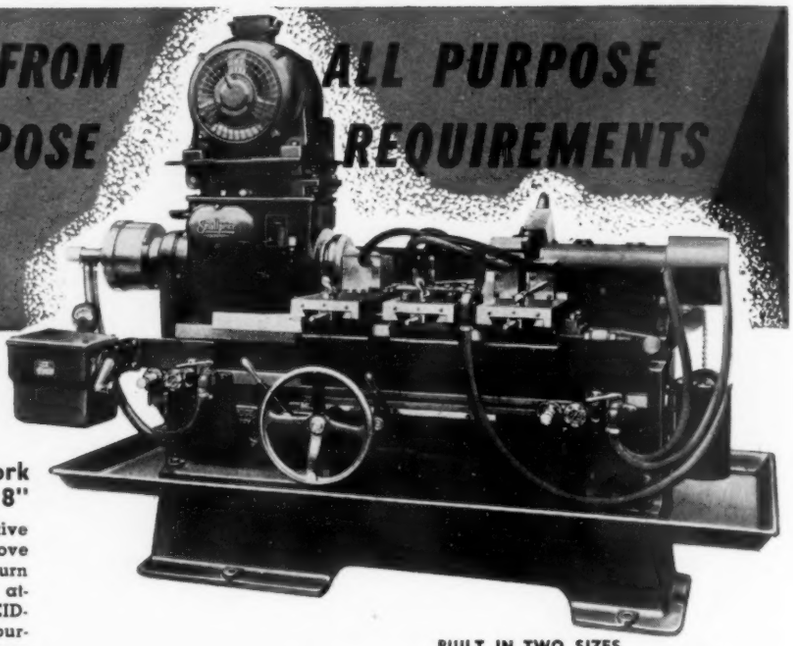
Another feature of this machine is the three slide carriage having independently cam-controlled slides operated through the Seneca Falls SIMPLIFIED CHANGE-OVER MECHANISM. Each slide may be set for different lengths of cuts by a simple adjustment of gear segments which are fitted with graduated scales corresponding to desired length of cut in inches.

The Model LR Lo-swing Lathe is completely automatic; the operator simply loads and unloads the work and pulls the starting handle.

LATHE NEWS from SENECA FALLS

QUICK CHANGE FROM ALL PURPOSE TO SPECIAL PURPOSE REQUIREMENTS

offered by this



MULTI-TOOL PRODUCTION LATHE

Relieves bottlenecks on armament work up to 58" between centers and 18" swing. This powerful, versatile, highly productive lathe will rough and finish turn, face, bore, groove form, wave, taper turn, vee, skim turn, profile turn and groove. Unit design together with special attachments make it possible to transform the REID-SMALLPEICE LATHE from all purpose to single purpose requirements quickly and easily. It offers many machines in one, thereby providing the means for keeping production moving without delays incident to installing other machines to do the same work.

BUILT IN TWO SIZES

	6 W. S. L.	9 W. S. L.
Swing over bed	12"	18"
Between centers	18"	22"
Admits between centers (long bed)	30"/42"/54"	40"/58"
Spindle Speeds	10	8
No. of feeds	10	15
Floor space	5½"x3'0"	7'8"x4'0"

WRITE FOR ILLUSTRATED BULLETIN, GIVING COMPLETE SPECIFICATIONS

REID BROTHERS, INC. MANUFACTURERS IN UNITED STATES Beverly, Massachusetts

SMALLPEICE, LTD., Ellwood L. Houtz, Agent

WALKER MAGNETIC CHUCKS there's a WALKER for YOUR needs

No. 618 Bar-Pole Magnetic Chuck

Universal Swiveling Magnetic Chuck

You are sure to find the magnetic chuck that will exactly fit your requirements when you come to Walker. There's no guesswork because Walker makes all types and sizes, including Rectangular, Swiveling, Vertical Face and Rotary designs.

Then, too, you are assured of having magnetic chucks that are the product of long, specialized experience—chucks that are designed and built right for the specific service intended.

If you need special chucks for special purposes, Walker can supply them promptly and at reasonable prices.

You'll save time and money by specifying "Walker" on your next magnetic chuck order.

Style "D" Face Plate "Concentric Gap" Type

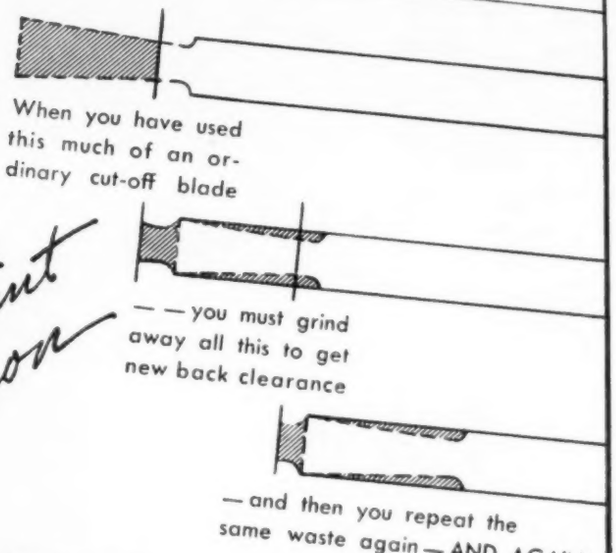
FULL DETAILS ON REQUEST

Ask for circular W-4

O.S. WALKER CO. INC. WORCESTER, MASS.

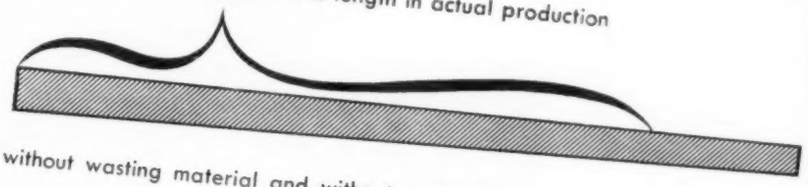
HOW TO SAVE TIME AND MATERIAL IN CUTTING-OFF OPERATIONS

INSTRUCTION MANUAL


When you have used this much of an ordinary cut-off blade
Today's Important Lesson
— — you must grind away all this to get new back clearance
— and then you repeat the same waste again — AND AGAIN!

With EMPIRE'S LUERS PATENTED CUTTING-OFF BLADES

you can use THIS entire length in actual production

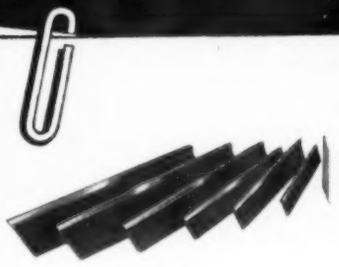


without wasting material and without wasting time in useless grinding.

The T Series is tapered* the entire length of the blade. A constant back clearance is thereby maintained regardless of the number of regrinds on the face (the only place where regrinding is necessary).

By using cut-off blades that eliminate this grinding for back clearance you not only save much valuable time which can be put to better use, but you also stop the waste of critical metal. You help to conserve steel.

*Blades, both tapered and parallel on the longitudinal cutting width, carried in stock.



EMPIRE TOOL COMPANY'S

LUERS PATENTED

CUTTING-OFF BLADES

are now in use on all these standard machines

•

Acme Gridley
Bardons & Oliver
Brown and Sharpe
Cleveland B Vertical
Cone Automatic
Davenport
Foster
Gisholt
Greenlee
Gridley
Libby
Midland
Millholland
Morey
National Acme
New Britain Automatic
Simmons
South Bend
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Luers patented cutting-off blades and holders are manufactured by Empire Tool Company under license issued by John Milton Luers Patents, Inc.

The Blades that reduce friction

EMPIRE Tool Co.

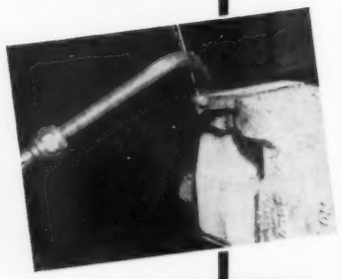
8778 Grinnell Ave. Detroit, Mich.

Don't LET TOOL SHORTAGES STOP PRODUCTION

Make tools with KENNAMETAL tips

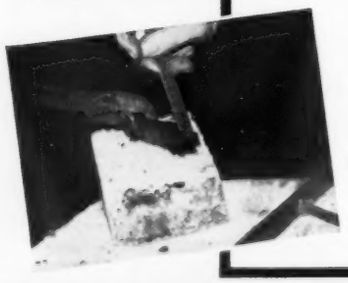
You can assure your plant of an adequate tool supply by getting KENNAMETAL standard tips and brazing them to your old shanks. This will save shank steel as well as permitting you to maintain an adequate tool stock. Where furnace brazing facilities are not available, torch brazing can be accomplished as below.

STEP 1. PREHEATING SHANK – Tobin Bronze, or other naval brass such as Chamet, or Silver Solders such as Ezy-Flo No. 3, are used in torch brazing. The shank is heated as recess with borax flux, such as Airco Marvel or Ezy-Flo No. 3. A non-oxidizing flame must be used and care must be taken to avoid burning or oxidizing the KENNAMETAL blank or the shank.



STEP 2. APPLYING BRAZING MATERIAL TO SHANK – When flux runs freely, recess should be "tinned" with brazing material by touching a 1/16" rod of bronze to it, allowing it to melt and run freely over the surface of the recess. KENNAMETAL blank may then be placed in the recess with tongs or pliers.

STEP 3. APPLYING TORCH AFTER TIP IS IN PLACE – Cover with flux and heat the underside of shank with torch until flux and bronze are again melted. Finally the torch may be applied to top of tool.



STEP 4. PRESSING TIP INTO PLACE – Press KENNAMETAL tip firmly into place with tang of file or other instrument and hold it until bronze has solidified. Allow to cool slowly and when quite cool, grind per instructions.

McKENNA METALS Co.

103 LLOYD AVE., LATROBE, PA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

What the man who looks ahead thinks about tapping

HASKINS *Precision* TAPPING EQUIPMENT

The man who looks ahead knows that someday he will have to switch back from war-time to peace-time production. That is why he demands *versatile* tapping equipment of *lasting* value. That is why *so many* men who look ahead are buying *Haskins* Tappers. These *standard* machines can quickly and inexpensively be set up for the new jobs ahead. They will *continue* to bring *lower costs per man and machine hour* long after Victory is won! R. G. Haskins Company, 2761 W. Flournoy St., Chicago.

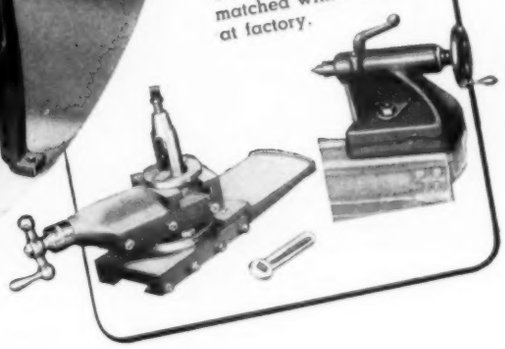
ARE YOUR AUTOMATICS OVERLOADED?

Many tapping operations, once handled on screw machines, are now performed faster, better and at lower cost as *second* operations on Haskins Tappers. Write for complete details of this money-saving way to speed production.

NEW BOOKLET—"Holding Fixtures for Haskins Tapping Machines"—contains many new ideas. Send for a copy

Logan Speed Collet Chuck for the No. 850 Lathe or others with a 1½" x 8 thread spindle nose. Capacity: ⅝" round bar stock. Quick acting. Positive squeeze grip No keys or wrenches needed.

The LA-3 Tailstock Assembly and the LA-13 Compound Rest Assembly (below) will permit the No. 850 Turret Lathe to be used also as a standard screw cutting lathe. The Tailstock Assembly must be ordered with lathe as it must be matched with headstock at factory.



LOGAN NO. 850 MANUFACTURING TURRET LATHE

SPECIFICATIONS: 1. Swing Over Bed, 10". 2. Bed Length, 43⅛". 3. Spindle Hole, 25/32", Capacity, ⅝". 4. Precision Ball Bearing Spindle Mounting. 5. Twelve Spindle Speeds, 30 to 1450 R.P.M. 6. Cross Slide Stroke, 3¼". 7. Six Position, Automatic Indexing Turret. 8. Stroke of Turret, 4¼".

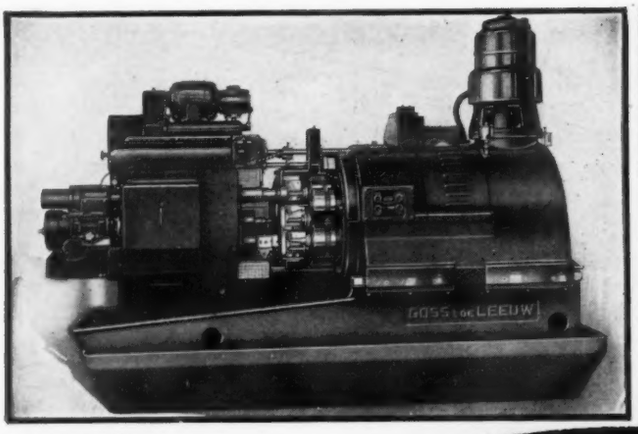
FOR CONTINUOUS PRODUCTION OF SMALL PARTS

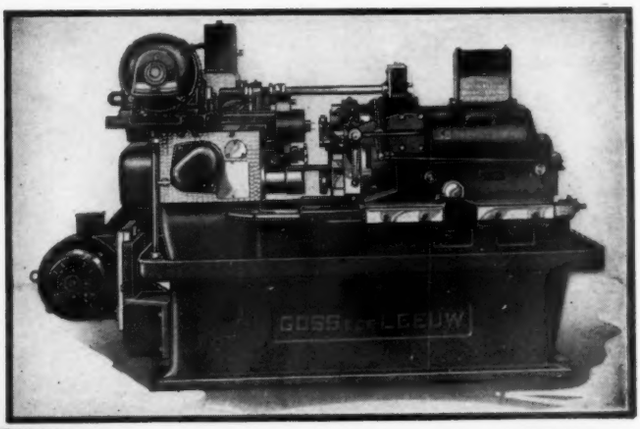
This new Logan Lathe is the answer to war industry's demand for a fine, small production lathe, in order that larger machines may be released for heavier work. With a maximum capacity of ⅝" round bar stock, the No. 850 Logan Manufacturing Turret Lathe will turn out small parts with the same speed and accuracy as that of larger machines, and the investment is considerably less. Advanced design and engineering, combined with the same high quality standards that have characterized all Logan Lathes, are assurance of long and satisfactory service.

LOGAN ENGINEERING COMPANY • CHICAGO, ILLINOIS

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES





WORK ROTATING TYPE

- 5 Spindles
- 6 Spindles
- 8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

- 4 Spindles
- 5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

SIMMONS 120"x96" HEAVY DUTY PLANER

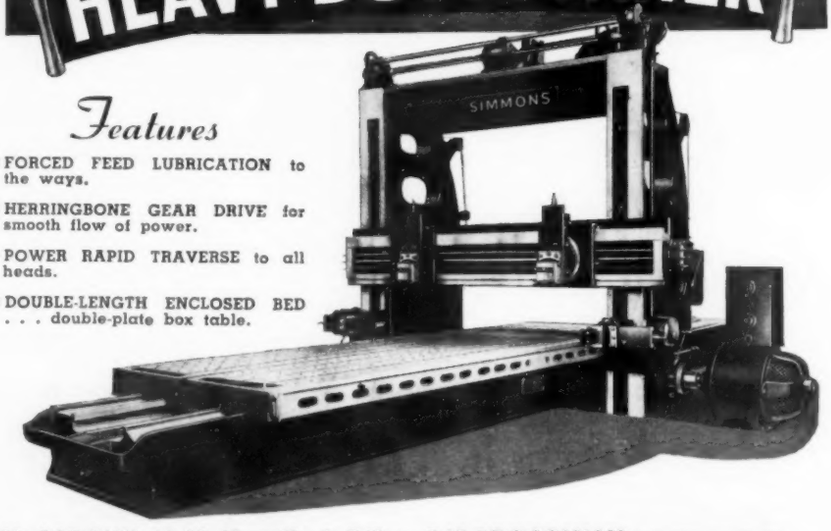
Simmons 120"x96" Heavy Duty Planer is designed for efficiency and economy of operation. Power Rapid Traverse to all heads operates through specially designed clutches. Double length enclosed bed is equipped with forced feed lubrication to the ways. Inner guide box table has one flat and one vee way, riding constantly in a film of oil. Bottom side of table entirely closed. Heavy ribs tie top and bottom securely.

Sykes herringbone gears used in all drive shafts up to bullgear and pinion which have spur teeth to mesh with table rack.

Electrical equipment includes constant potential reversing motor drive with 50 H.P. D.C. 230-v. 150-900 R.P.M. motor control. Table Speeds 19 to 115 feet per minute. Write TODAY for bulletin giving complete details.

Features

- FORCED FEED LUBRICATION to the ways.
- HERRINGBONE GEAR DRIVE for smooth flow of power.
- POWER RAPID TRAVERSE to all heads.
- DOUBLE-LENGTH ENCLOSED BED . . . double-plate box table.



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Diameters

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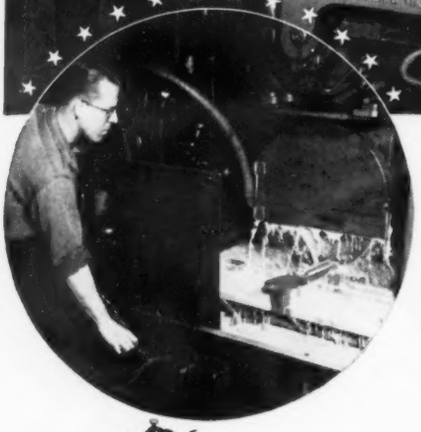

▲ *(Above)* **CAMPBELL #250 NIBBLING MACHINE** in high speed aircraft production in a plant in the Middle West. Note 2-hand grip of operator for perfect control.

◀ **CAMPBELL #302 ABRASIVE CUTTING MACHINE** working on hardened slab stock for high speed war production.

the Campbells have come!

Campbell Cutting Machines have come a long way—plenty of them are on the job, helping war production plants increase output and get maximum use of floor space.

For example, you'll find **CAMPBELL ABRASIVE CUTTING MACHINES** handling jobs on Aircraft, Aircraft Engines, Crankshafts, and Propellers—on Army Trucks, Cars, and Tanks—on Machine Guns, Bombs, Shells, Projectiles, and Small Arms Ammunition—on Field Telephones.

CAMPBELL NIBBLERS handle sheets to 72" in width and to ½" thick, are instantly adjustable to any thickness; feature speed changes to 350, 500, or 800 R.P.M. and cut in any direction—cutting so clean that work requires little or no finishing.

Ask to have a Campbell Engineer suggest what can be done in your plant. No obligation.

ANDREW C. CAMPBELL DIVISION
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AMERICAN CHAIN & CABLE COMPANY, INC.
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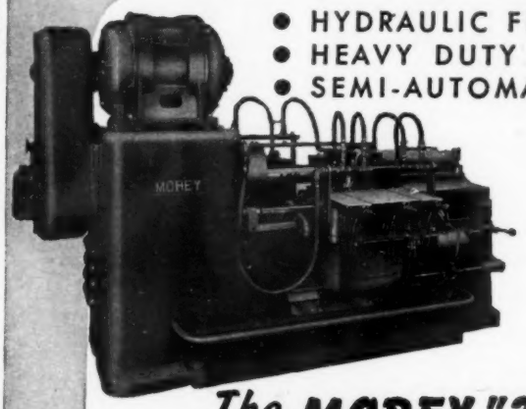
Suitable for 105 M.M. to 155 M.M. Shells



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- HEAVY DUTY
- SEMI-AUTOMATIC

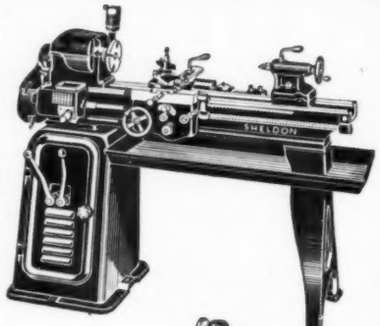
The MOREY "27" SHELL LATHE

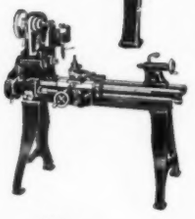
Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.

SHELDON Back Geared Screw-Cutting PRECISION LATHES





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The finest 10", 11" and 12" lathes ever built in the moderate price field. Large special analysis steel spindles GROUND ALL OVER, with extra collet capacity. Hand-scraped Bronze, Ultra-Precision Ball or Super-Precision Roller spindle bearings, (the finest bearing obtainable). Heavy braced, semi-steel beds with hand scraped ways (2 V-ways and 2 flat ways). These lathes come with a choice of aprons, gear boxes, and drives including the anti-friction, 4-speed, V-belt Lever-operated pedestal base motor drive illustrated. Telescopic Taper Attachment and other accessories available.

FOR PRODUCTION

Lathes with lever operated collets, lever cross slides and tailstocks. Ideal for second operation work—sturdily built precision tools.

FOR MACHINE SHOP

and maintenance department lathes, with a wide choice of attachments, accessories and drives.

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Just out "The Care and Operation of a Lathe" to help apprentice training. 50¢ list price, discounts for quantity purchases.

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"I CAN BUY CHEAPER CARBIDE TOOLS!"

It's not PRICE per tool— but PRODUCTION per tool that determines cost!

IF all Carbide Tools were alike in quality — it would pay you to buy the lowest price tool.

But they are NOT all alike!

You can specify TECO Carbide Tools—yet save money because you get more production from each tool.

TECO Carbide Tools have proved definitely, on job-for-job comparisons with other carbides, that they operate at higher speeds—hold their cutting edges longer — produce more pieces between grinds — with less down time for re-tooling.

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TECO engineers pioneered in the development of tungsten carbides in America, as far back as 1917. Today, these same engineers are putting the results of 25 years research and experience into the manufacture of TECO carbides—producing a carbide most needed for today's exacting requirements.

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SENSATION IN '32
SALVATION IN '42

Victor Saw Works, Inc. advertisement on front cover of "American Machinist" for February 4, 1932.

Ten years ago, the first molybdenum alloy hack saw blade—introduced by VICTOR—was the sensation of the metal cutting industry, bringing tungsten high speed steel performance at half the cost.

Today, the molybdenum alloy blade is the salvation of the metal cutting industry, for today's VICTOR "Moly"* High Speed—ahead in steel analysis and heat treatment—is maintaining and accelerating production schedules for those accustomed to the use of other high speed steel blades.

Whenever you buy molybdenum alloy blades, be sure you get the original, genuine VICTOR "Moly"* High Speed, easy to identify by its all-over gold metallic finish.

VICTOR SAW WORKS, INC.
MIDDLETOWN, NEW YORK

To speed work and save blades give your men this fact-packed 20-page booklet on selection, use and care of hack saw blades and frames. Get it free from your supplier or write direct.

3184

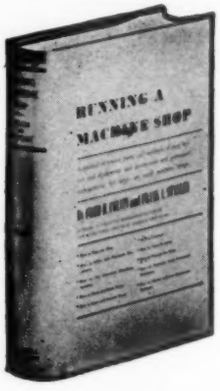
**T. M. Reg.—Blades bearing the name "Moly" are made only by Victor Saw Works, Inc. and affiliated companies.*

Is your shop geared for emergency production needs?

How about *management?* Have you taken every means of improving your shop layout and handling of tools, work, records, men, etc., so as to eliminate bottlenecks and put through the greatest amount of profitable work in the busy days ahead? Here's a great new book by the famous machine-shop writers, Fred Colvin and Frank Stanley, in which owners and managers, foremen and shopmen can find practical means of straightening out all the intricacies of running a machine shop for maximum productiveness.

Running a Machine Shop

By Fred Colvin,
Editor Emeritus,
American Machinist,
and Frank Stanley,
Editor,
Western Machinery and Steel World,
403 pages, 6x9, 146 illustrations.. **$3.50**



HERE is the book to answer the questions that don't have to do with machine operations, yet that affect shop profits in many ways. How to set up and equip the shop, how to plan work, how to inspect and control it, where economies may be made, how production may be improved, how to keep records, how to manage men—these are the sort of important problems explained here on the basis of successful methods now in use.

Here are valuable pointers on:

—selecting machinery
—buying used machinery
—keeping machines in condition
—timesaving tool trucks
—moving work about the shop
—conveyors in the job shop
—toolroom layouts
—making the tool crib pay
—allocating machine hours
—shortening work travel
—estimating on contract work
—estimating from blueprints
—foremen's meetings
—farming out work
—planning for slack times
—modernizing a shop
—where and when to inspect
—saving motions in assembly
—etc., etc.

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Type J

NOTE TO ARMAMENT INDUSTRY: ***Radiac is being widely used for splitting shells (both explosive and armor piercing) prior to surface grinding and application of Brinnell testing.***

SPEED! Every part is designed to speed the work of the operator—the patented vise clamps firmly and quickly for straight or angular cuts to 45°; wheels and flanges can be changed with the minimum loss of time.

ACCURACY! The massive, balanced rigidity of the entire machine provides VIBRATIONLESS cutting to exacting accuracy and cleanness.

INCREASED WORK PER WHEEL! Lack of vibration means longer wheel life. As wheel wears, smaller flanges can be substituted, thereby increasing wheel life. Radiac is available with 18″ wheel—10 H.P. motor.

EASE OF OPERATION! Perfected balance of motor and head reduces muscular effort and operator fatigue (foot treadle also available).

WORK VISION! The work area is free from hampering obstruction. The operator has constant and unimpaired view of work.

CAPACITY! Type "J" accommodates solids up to 2½″ and tubing up to 4″ in diameter on production work—larger for miscellaneous work.

RADIAC DOES IMPORTANT JOBS for IMPORTANT CONCERNS

Such as

Bethlehem Steel
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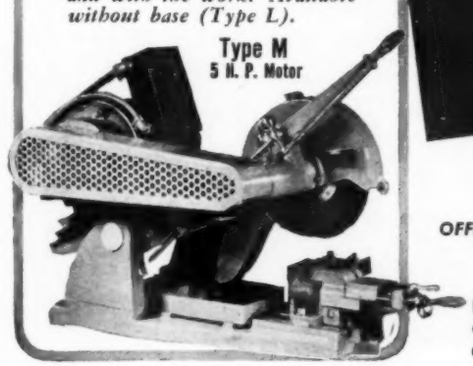
and many others.

PRACTICALLY PORTABLE

The Type "M" Radiac is a smaller unit doing a big job in many ways. It can handle materials up to 1¼″ cross section—yet is easily portable to and with the work. Available without base (Type L).



Type M
5 H. P. Motor

Always in the lead in perfected performance, the Radiac Cut-Off Machine and Radiac Abrasive Cut-Off Wheels today stand unequalled in advantages to industry.

RADIAC
CUT-OFF MACHINES

A. P. DE SANNO & SON, Inc.

PHOENIXVILLE, PENNSYLVANIA

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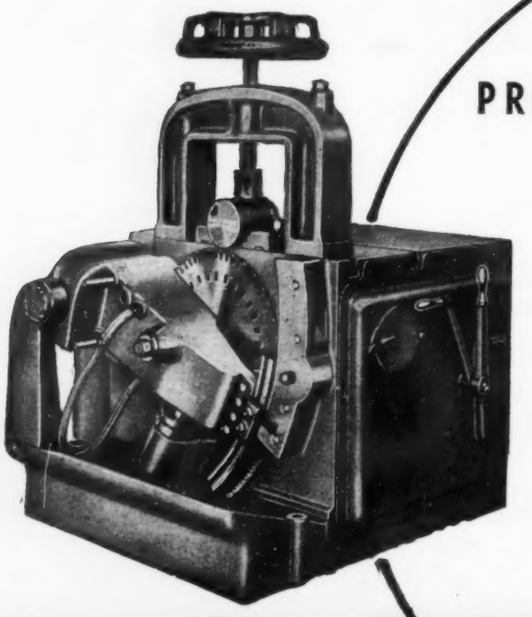
Save Time—Cut Costs

with the

PORTER-McLEOD

PRODUCTION Cutting-Off Machine



This new 8" machine will step-up production and make such big returns in time and money savings in cutting stock for 3 inches up as to quickly return its first cost.

Here's the machine to break bottlenecks in cold metal sawing—a machine that's versatile, fast, powerful and accurate, yet easy to control and economical to operate. You can put it to work on single pieces or by nesting of bars or shapes, handle multiple unit cutting up to the capacity of the machine.

The outstanding speed of this machine is made possible by features which protect blade and work and save power. For example, due to the leverage exerted on the blade, which is supported close to its rim and pulled through the cut, buckling of the saw is prevented and accuracy as well as straight cuts assured. Friction feed insures against blade breakage.

The standard feed of this machine is 3 inches and this can be stepped up for brass and non-ferrous metals.

Get all the facts about this new production machine by writing today for illustrated bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

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for ECONOMY—for HIGH SPEED PRODUCTION

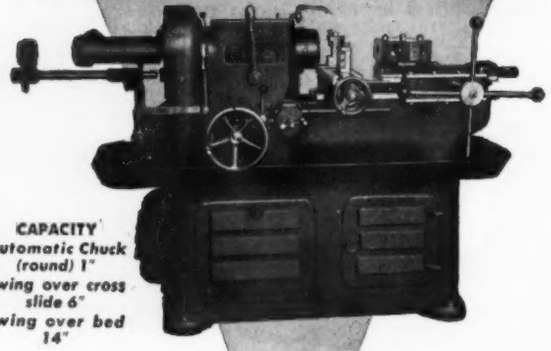
The MOREY 2G

Back-Geared

TURRET LATHE

Timken Bearing

Self-Locking Turret and Infinite Spindle Speeds



CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.

AMESACKS

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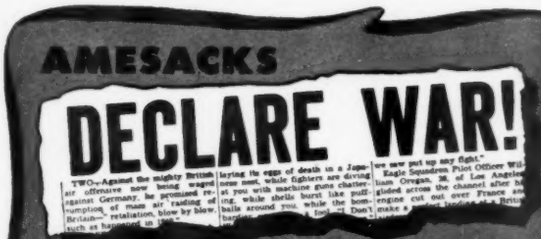


ON WASTED TIME!

In the present emergency, TIME is our greatest ally—and lost TIME can never be regained!

AMESACKS can cut packing and shipping time of small parts as much as 90%—save you precious hours on vital war deliveries.

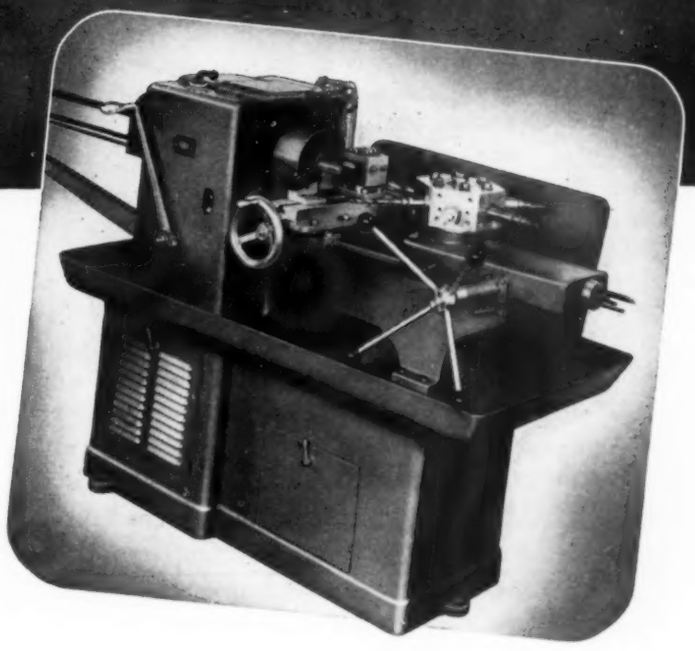
So start using AMESACKS now . . . and speed shipping operations for your company *and* your country. Send for free samples.

★ ★ ★ JUST POP 'EM IN AND PULL THE STRING ★ ★ ★

AMES BAG COMPANY

1971 EAST 66TH ST. · CLEVELAND, OHIO

Beginners learn rapidly on this *Simplified* machine



OSTER

NO. 601 "RAPIDUCTION" Turret Lathe

In double-quick time, you can train new operators on the Oster No. 601 SIMPLIFIED Turret Lathe. This motor driven machine is equipped with manually controlled, 6-position turret, or with plain saddle, as desired.

Another option is the choice of either worm drive or direct drive. Automatic chuck capacity is 1½" round bar. Swing over bed is 14". Swing over cross slide is 6½".

Complete details in Catalog 27-A. Write, wire, or 'phone for a copy.

THE OSTER MANUFACTURING CO.
2049 East 61 Street • Cleveland, Ohio, U. S. A.

★ ★ ★ ★ ★ ★ ★ ★

How you can save on Diamond Wheels!

TYPICAL COMPARATIVE DIAMOND WHEEL COSTS

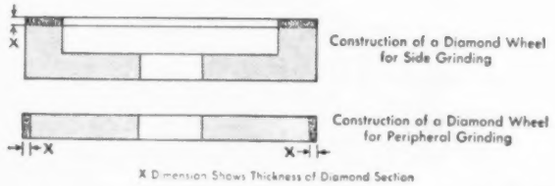
	Depth Diamond Section	Cost per Wheel	Number Wheels Required for Equal Service	Total Cost for Same Amount of Grinding Service	Saving Resulting from Using Thicker Section
TYPE D6W CUP WHEEL					
Diamond in Rim					
6" x 3/4"—3/4" Rim	1/32"	$63.55	4	$254.20	
100 Concentration	1/8"	184.65	1	184.65	$69.55
Same Wheel	1/16"	63.55	2	127.10	
50 Concentration	1/8"	103.90	1	103.90	23.20
TYPE D1T STRAIGHT WHEEL					
Diamond in Periphery					
6" x 1/8"	1/16"	30.05	4	120.20	
100 Concentration	1/4"	73.80	1	73.80	46.40

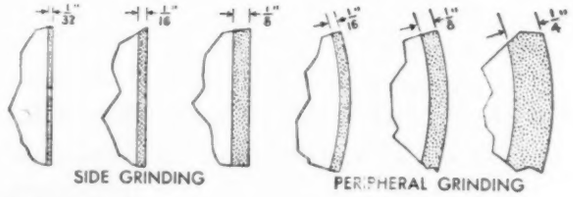
● The thickness of the diamond, or grinding, section of standard diamond wheels varies from 1/32 to 1/4 inch. Actually it is better economy to use the thicker sections wherever possible. A 1/8 inch section, for instance, contains four times as many carats of diamonds as the thinnest section, and does four times the work. But the cost of one 1/8 inch section is far less than its equivalent of four 1/32 inch sections.

Why? Because in the first instance you pay for only *one* basic wheel shape, or "preform" and in the second you pay for four! Thus you save money by specifying the thicker diamond sections. The table above shows actual savings in a few typical cases.

By buying wheels with thicker diamond sections you save more than your *own* money. You also help conserve essential war materials and labor.

We urge you to take advantage of this saving, and thus also cooperate with us in conserving time and materials vital to our mutual war effort.


Construction of a Diamond Wheel for Side Grinding
Construction of a Diamond Wheel for Peripheral Grinding
X Dimension Shows Thickness of Diamond Section

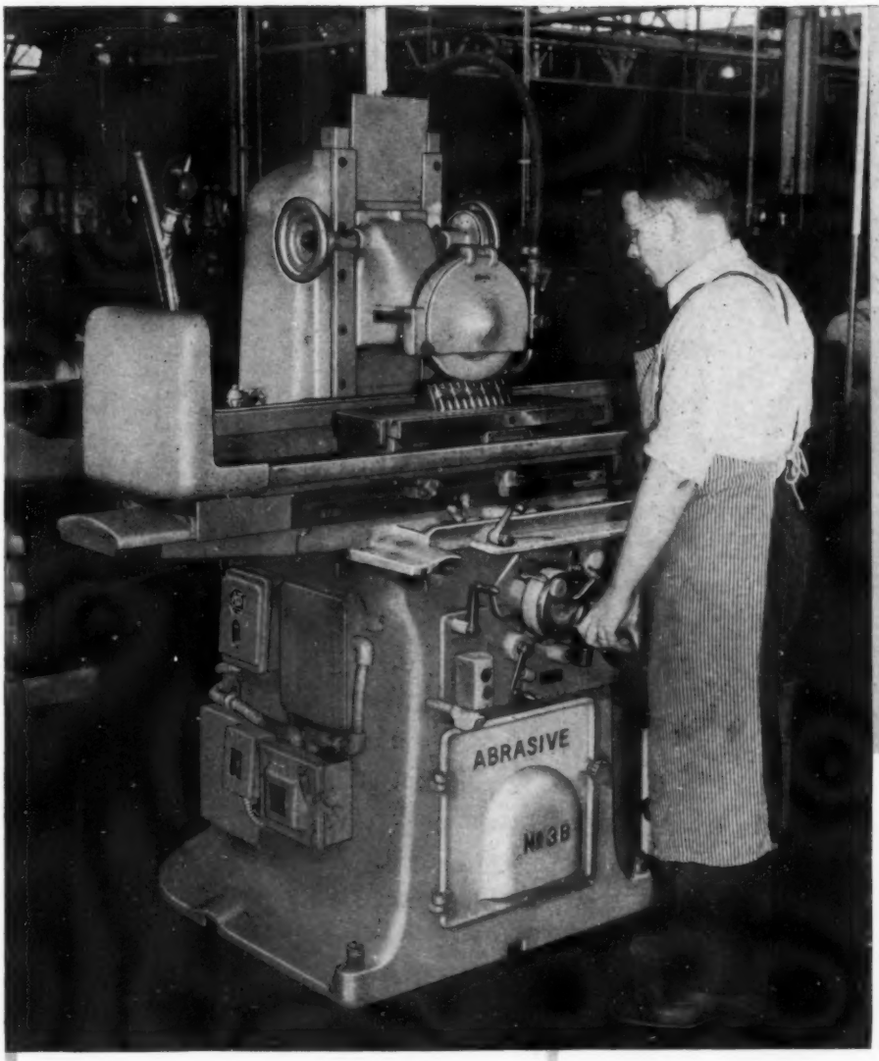


CARBORUNDUM
ABRASIVE PRODUCTS

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.
REG. U. S. PAT. OFF.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)



Accuracy is essential

1 IN SNAP GAGES

2 IN ABRASIVE SURFACE GRINDERS

But accuracy—either in a gage or a surface grinder—isn't something that "just happens!"

Whatever the product, it is safe to say that "accuracy" depends upon design, materials, workmanship, and supervision.

NO. 1½ HAND-OPERATED SURFACE GRINDER

NO. 34 VERTICAL SPINDLE SURFACE GRINDER

The founder of this Company started in 1916 with a sound idea for building an accurate Surface Grinder. Improvements made since that date in "Abrasive" Surface Grinders have been the result of constantly expanding experience which has led to better designs; use of better materials as they have become available; improved workmanship; and the most careful supervision of every operation.

We are confident you will be as pleased, as thousands of other users, with "Abrasive" accuracy.

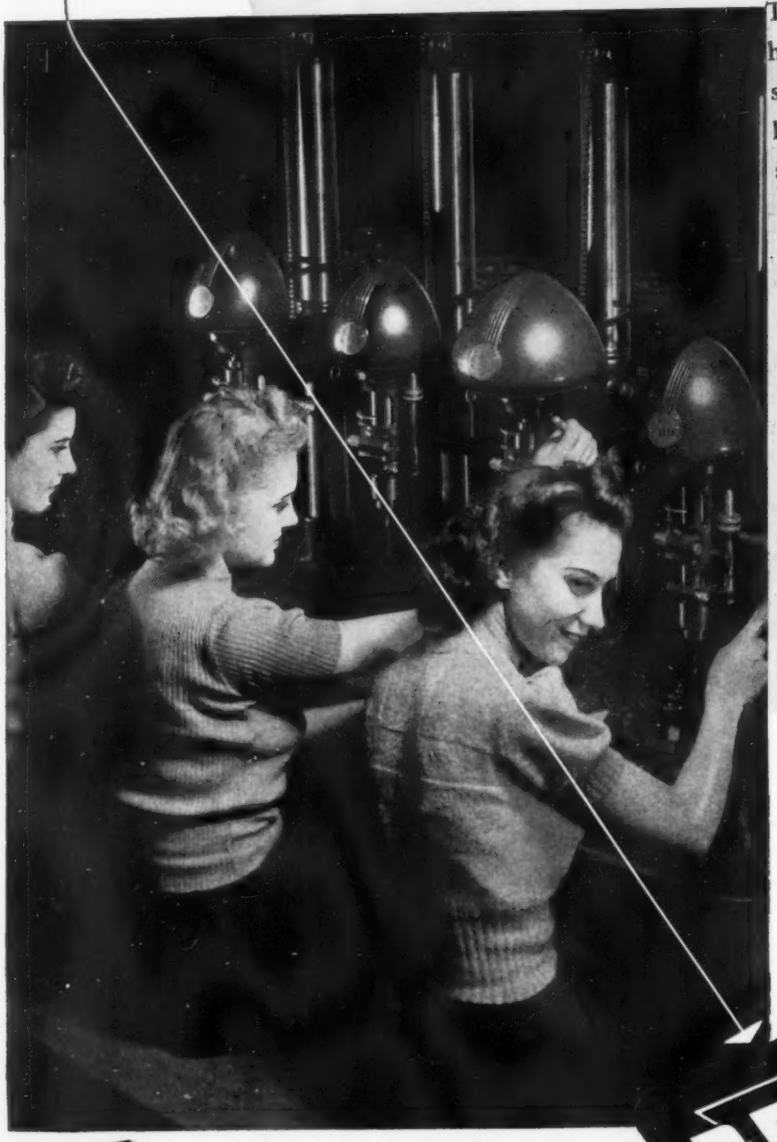
Catalogs illustrating any of these three machines shown will be gladly furnished, address—

ABRASIVE MACHINE TOOL COMPANY

Dealers in Principal Cities

EAST PROVIDENCE · · · RHODE ISLAND

THE NEW LABOR ARMY LIKES THESE MACHINES



These "minute women of '42" by the hundreds of thousands are setting a smooth fast pace on batteries of Delta low-cost Drill Presses, Grinders, Saws, and other Delta machines. A few months ago they didn't know the difference between a drill press and a punch press—a cut-off machine or cut-off switch. Now they are handling their machines like veterans and meeting production quotas with ease.

Management likes these machines too, because "breaking in" women and unskilled labor can be done in an unusually short time. Most important, skilled mechanics are released for more difficult work.

DELTA DESIGN
always offers these Advantages

Low First Cost
Low Maintenance Cost
Economical Operation
Reduced Labor Costs
Greater Flexibility
Portability

SEND FOR *"TOOLING TIPS"*

Showing how other manufacturers are taking advantage of the many features of DELTA-Milwaukee machines. Also for latest complete catalog. Get in touch with your Delta Industrial Distributor or write to the Delta Manufacturing Company, 608-M E, Vienna Ave., Milwaukee, Wis.

DELTA MILWAUKEE

The Complete DELTA-Milwaukee line consists of low-cost, high-quality Drill Presses, Cut-Off Machines, Grinders, Abrasive Finishing Machines, Saws, Lathes, Jointers and Shapers.

The NEW #42 MURCHEY THREAD MILLING MACHINE

. . . for mass production of accurate, concentric external and internal threads from 4" to 12" diameter

This new machine meets the ever increasing demand for larger threads of extremely close tolerance produced uniformly with absolute concentricity.

PERFECT CONCENTRICITY

Internal or external surface being threaded remains concentric with O.D. or I.D. because work does not revolve or move in any way. On this machine, the milling hob revolves eccentrically about the work and simultaneously rotates on its own axis until the cutting teeth of the milling hob are advanced into the work sufficiently to produce the required depth of thread.

When full depth has been attained and the milling operation completed, the cutter spindle automatically returns to center permitting facing and counterboring operations with guaranteed concentric relation of thread.

Outstanding Features Contributing to Fast, Precision Work and Long Life

. . . hardened and ground lead screw mounted direct on eccentric spindle bushing.

. . . rugged heavy construction throughout with sliding table mounted on amply large ways.

. . . fixture table provided with two "T" grooves and one keyway which is used only for locking purposes. "T" grooves used only to bolt fixture to table.

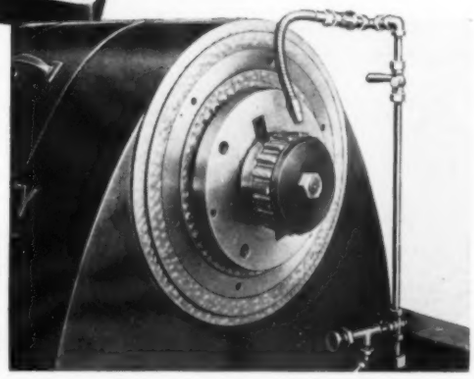
. . . all controls conveniently located near head.

. . . large spindle hardened and ground and mounted in Timken preloaded roller bearings.

. . . outer eccentric spindle sleeve runs in adjustable special phosphor bronze taper bearings.

. . . complete hydraulic unit actuates cutter feed and cutting cycle.

. . . machine may be stopped at any point in its automatic working cycle.



CONDENSED SPECIFICATIONS

Capacity: 4" to 12" dia. external or internal threads

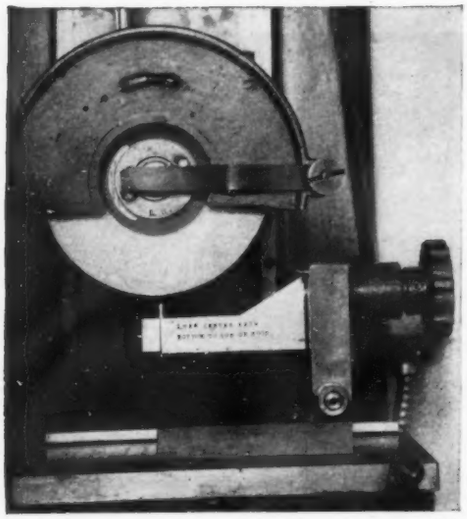
Eccentric motion of spindle: 0" to ¾"

Speeds of Cutter Spindle 33 to 645 R.P.M.

Floor space: 371½" x 100"; height 57"

Table size 21" x 30".

Murchey MACHINE & TOOL CO. . . . . DETROIT, MICHIGAN



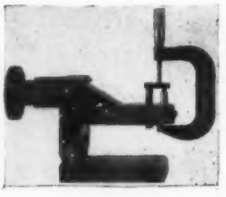
Simplify Grinding Radii and save Valuable Time • • • •

with the NEW C-66 RADIUS DRESSER

1—Faster, more accurate dressing
2—Ability to dress for radii where clearance angle on radius is involved
3—No necessity to remove wheel guard
4—Open and easy to see dressing operation
5—Ability to rotate 180° or 90° in either direction, with stop pins
6—Simple setting of diamond
7—Ability to use several sizes of diamonds and hold them accurately in ground vee
8—Safety feature, hands are kept away from under the wheel

Price $72.50 without diamond, $5.00 extra with diamond

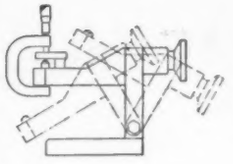
Diamond is set by measuring with micrometer from top of hood to bottom of arm.



Vee Ground in Center of Arm

.013 Male and Female Radius

.500 Male and Female Radius



Radius Dresser can be set at clearance angles for turning tools.

SCHULTZ & ANDERSON CO., 109 EDISON PLACE, NEWARK, N. J.

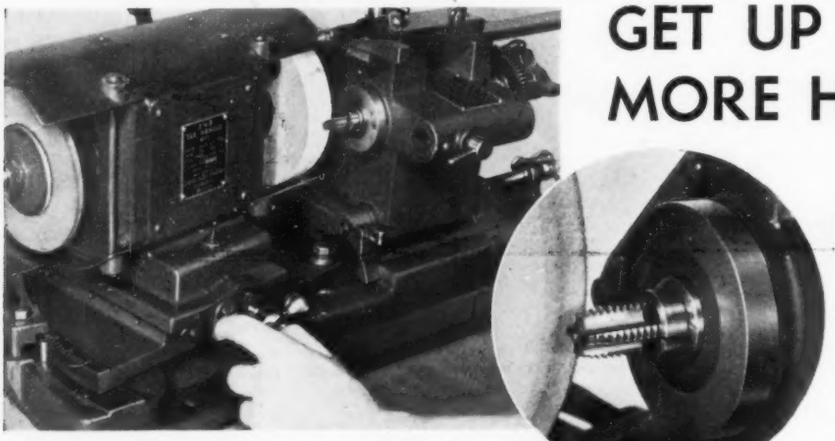


Photo at right shows tap held in Blake bushing.

GET UP TO TEN TIMES MORE HOLES PER TAP

By sharpening them on the

BLAKE TAP GRINDER

The Blake Tap Grinder has shown that the practice of throwing away dull taps is extremely wasteful. In these days of war production, a continuation of this practice is almost criminal.

Why scrap dull taps when the Blake assures you of at least double the number of tapped holes, and in most cases will increase them ten times?

The Blake will grind the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 and 10 flutes. Capacity—No. 0 to 2". Additional profits and production may be had by sharpening countersinks and other small tools on the Blake Tap Grinder. (Formerly called the J-B Tap Grinder.)

Please send folder giving complete details on the Blake Tap Grinder.

NAME ..... TITLE .....

COMPANY .....

STREET .....

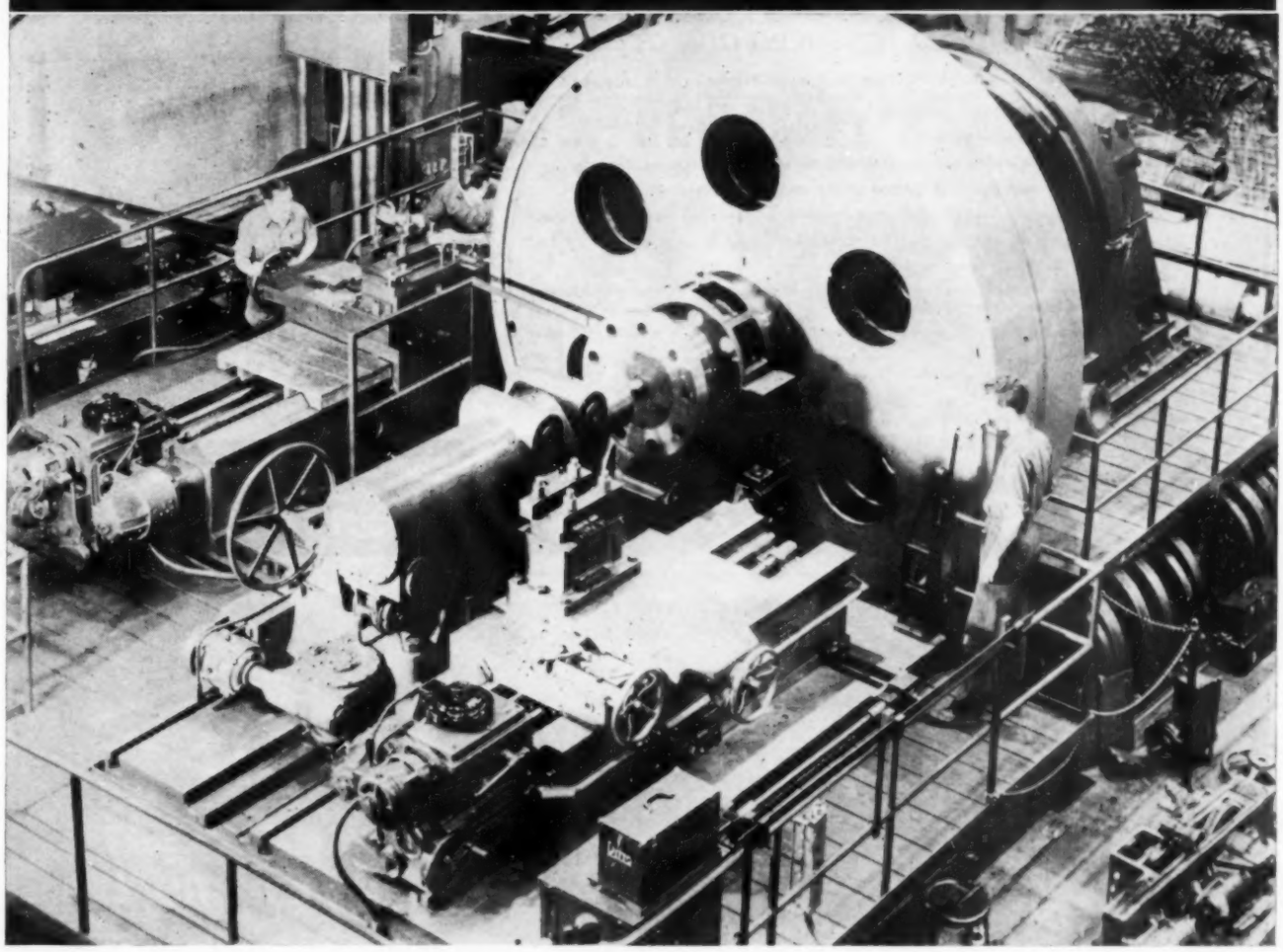
CITY ..... STATE .....

A.M.

EDWARD BLAKE COMPANY
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

J-B TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS

ANOTHER FITCHBURG ACHIEVEMENT



Built by Fitchburg Engineering Corporation. This lathe has a swing of 200". Headstock and tailstock are both adjustable up to 16 ft. between centers. The front tool conveyor bed is 14 ft. long and carries two compound tool carriages for turning the rim and facing the edges of Marine turbine reduction gear blanks. The back tool conveyor bed is 8 ft. long and carriers one tool carriage for truing up shafts and couplings, and turning locating spots on side of gear. Four of these giant lathes are now in use by large manufacturers of Marine turbines, and five more are being built.

CONSULT FITCHBURG ON YOUR REQUIREMENTS

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

"Blount"

"COMBINATION" MODEL J

WET TOOL GRINDER

meets todays need for speed and accuracy

This machine is a valuable contribution to fast production. It is equipped with straight faced wheels for wet grinding, is remarkably convenient in operation and can be depended on for cool, clean grinding.

Modern and improved features include:

. . . heavy column with ample coolant tank and water pan of generous capacity.

. . . guards of heavy cast iron with hinged covers and adjustable spark protectors.

. . . centrifugal motor-driven ball bearing pump with all bearings above water line.

. . . spindle of high carbon steel, machine turned and ground.

. . . deep groove ball bearings protected against grit.

. . . exclusive design Blount grinding rest incorporating coolant ejector which assures cool tools and clean wheels.

. . . totally enclosed motor with manually operated switch having overload protection.

. . . foot treadle switch (available as an extra) keeps machine running only while operators foot depresses treadle.

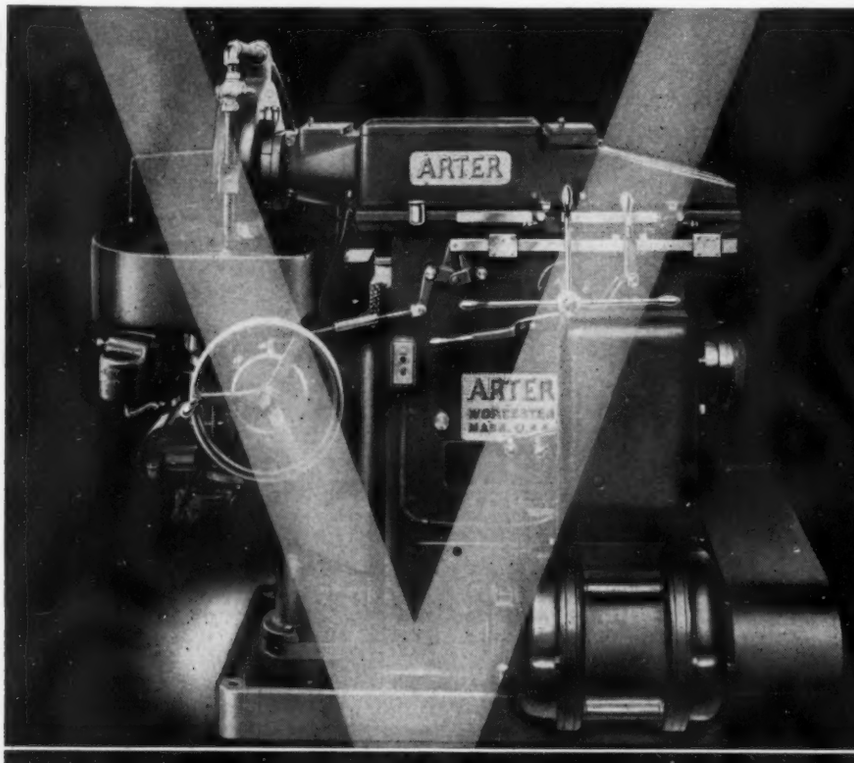
Write for Bulletin A-8

COMPLETE DETAILS AVAILABLE ON REQUEST

CONDENSED SPECIFICATIONS

Base of Column—22" x 19½"
Height base to spindle—37½"
Spindle Arbor—1¼"
Wheels 12" x 2" x 1¼"
Between wheels—22½"
Spindle speed—1750 R.P.M.
Motor—2 HP.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*



ARTER

V also stands for VERSATILITY.

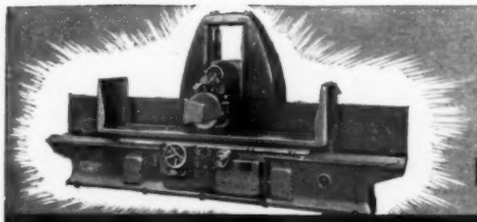
Arter Rotary Surface Grinders give you wide versatility — precision surface grinding on a wide variety of surfaces.

Are you using your **Arter Rotary Surface Grinders** to their full capacity?

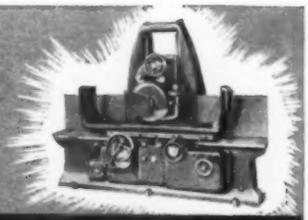
Arter grinding engineers are always at your service — to help you gain production-plus, the all-important need of the hour.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.



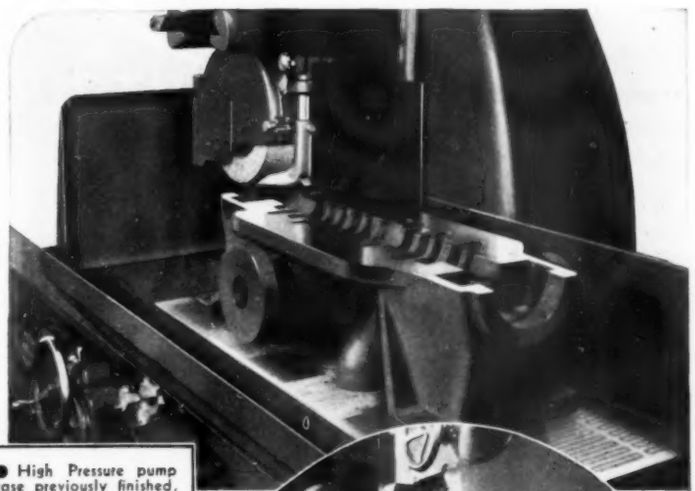
MATTISON
HIGH-POWERED PRECISION SURFACE GRINDER



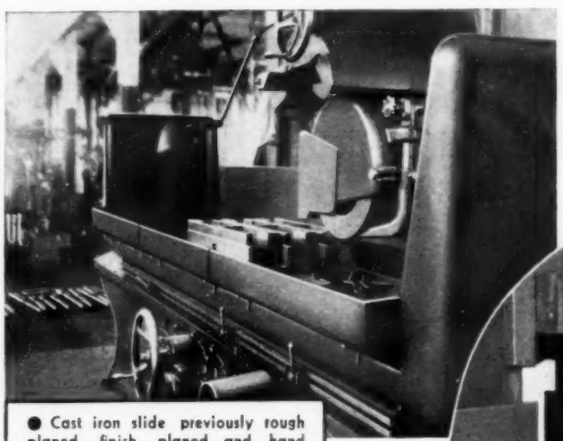
Cuts time up to 75%
ON JOBS PREVIOUSLY HAND SCRAPED

Examples: Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this not only make a big difference in manufacturing cost, but help speed up delivery schedules. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.

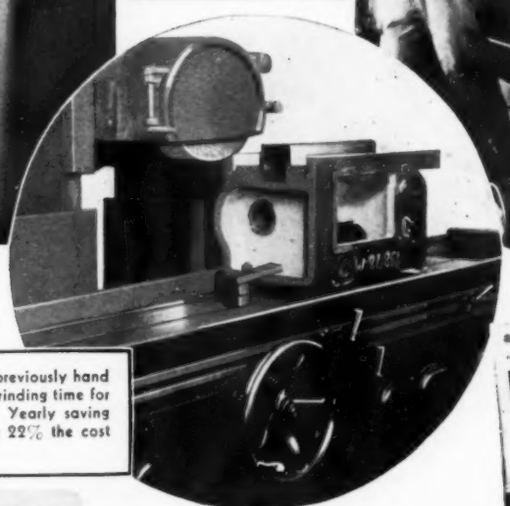


● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".



● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.

● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

SET-UP SHEETS
Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

SELECT THE RIGHT WHEEL

AND SAVINGS WILL FOLLOW

Vitrified makes it possible to standardize on grinding wheels by offering a wide range of standard types which cover practically all wheels used on standard makes of grinding machines.

Selection of the right wheel for the work to be handled is simplified in the Vitrified catalog—a 65-page booklet which gives specific data, dimensions, etc., covering the entire Vitrified line.

Send for this catalog. Choose a grinding operation in your shop on which you would like to cut costs. Select the Vitrified wheel which meets your specifications, try it out, and commpare results with the method formerly used—and you, too, will join the long list of progressive manufacturers which have standardized on Vitrified.

Write for the catalog today

VITRIFIED

VITRIFIED WHEEL COMPANY
WESTFIELD **MASS.**

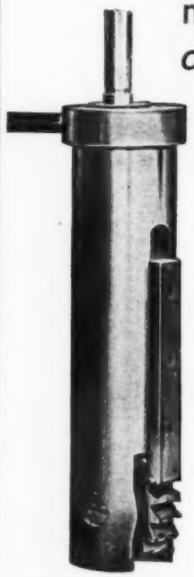
CRITERION
Boring Heads
Speed
PRODUCTION

These Criterion heads save time! Smooth, compact, rigid! Large, easy-to-read, graduated dial. Lead screw is hardened tool steel. ITS THREADS ARE GROUND FROM THE SOLID AFTER HARDENING, assuring constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Two sizes. 1½" and 3" ½" and 1" bar capacity Ask your dealer, or order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA
NEW YORK OFFICE 205 E. 42ND ST., N. Y.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters *and saves time and money*



● With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

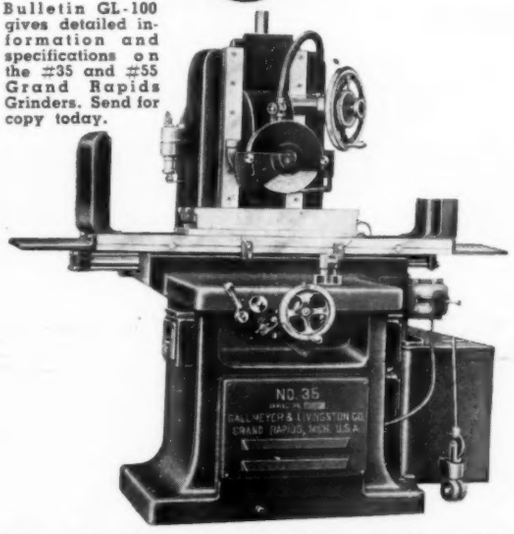
BEHIND THE FIGHTERS !

GRAND RAPIDS GRINDERS SPEED PLANE AND ENGINE PRODUCTION...

G & L Grinders are playing a big part in maintaining the speed and accuracy so essential to air plane engine production. Whether in tool room service or on the production line, Grand Rapids machines can be depended on for those extremely close tolerances demanded in the vital parts of our fighter ships - of - the - air. Grand Rapids Surface Grinders fulfill every requirement for precision work because they are precision machines. In addition they are fast and convenient, making it possible to meet difficult production schedules with least possible effort on the part of the operator.

There's a Grand Rapids Grinder for every class of armament production.

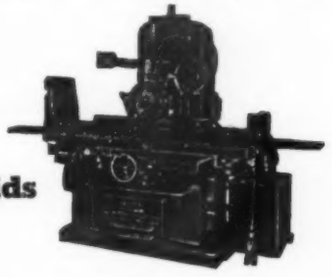
Bulletin GL-100 gives detailed information and specifications on the #35 and #55 Grand Rapids Grinders. Send for copy today.



No. 35 Grand Rapids Hydraulic Feed Surface Grinder

This Grand Rapids machine is ideally suited to close tolerance grinding because of its smooth operation. Rigidity of construction and permanence of alignment are assured by a massive one-piece column and base casting. Cross feed ways are of generous proportions so that the weight carried is immediately above the base walls eliminating all possibility of sag or alignment.

The #35 Grand Rapids has a table working Surface of 8"x24", automatic longitudinal table travel of 26" and a transverse travel of 9¼".



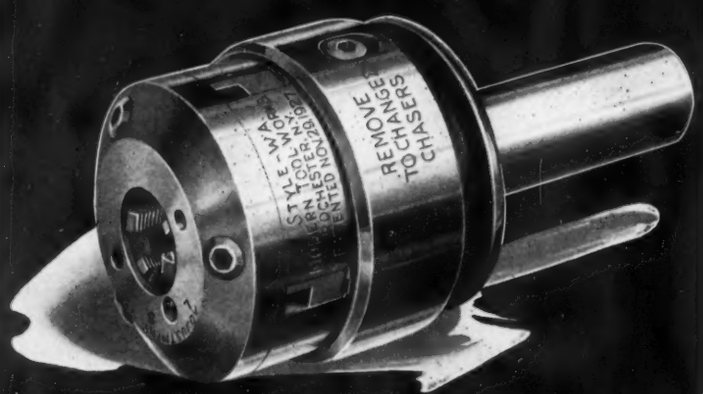
No. 55 Grand Rapids Hydraulic Feed Surface Grinder

Similar in basic construction to the #35 machine, the #55 machine provides a table working surface of 12"x36", automatic longitudinal table travel of 38" and a transverse travel of 13½". Spindles on these machines are mounted in preloaded ball bearings. A separate motor is used for driving the grinding wheel spindle. The spindle head has the elevating screw directly central between the vertical ways so that any tendency to cramping action is eliminated.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

MODERN ROTARY TYPE SELF-OPENING DIE HEADS



"WA" Die Head—Ring Type, for opening and closing

"WB" Die Head—Trigger Trip Type

FOR *Fast, Accurate and Economical Thread Cutting*

- Least number of parts.
- Simplest construction.
- Hardened and ground throughout.
- Cut close to shoulder threads without special chasers.
- Easily adjusted for thread size.
- Require no springs to operate movement of chasers.

Made in four sizes having capacity for cutting:

Straight Threads from 1/8" to 1 1/4"
Straight or Taper Pipe Threads from 1/8" to 3/4".

Send for your copy of Bulletin M-142 on Modern Rotary Type Self-opening Die Heads!

CONSOLIDATED MACHINE TOOL CORPORATION
MODERN TOOL WORKS
DIVISION
ROCHESTER, NEW YORK

Practical Boring to Limits Like This: +.0002" −.0001"

PRECISION BORING DATA

PART—End Bracket.
MATERIAL—Cast Aluminum with 1020 Steel Insert.
HOLDING METHOD—Special Fixture.
LOCATION—On Rabbit Fit Dia.
MACHINE—#200 Simplex Precision Boring Machine.
OPERATION—Bore 1.0230" Dia. Hole.
TOLERANCES—+.0002", −.0001".
FEED—1⅞" per Minute.
SPEED—1150 r.p.m.
FLOOR-TO-FLOOR TIME—4 Minutes, including inspection time.

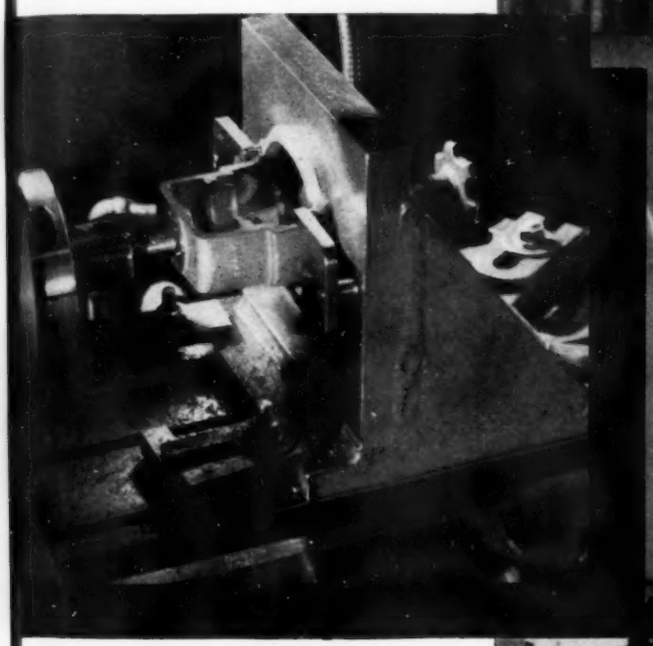
SIMPLEX UNIT-TYPE BORING MACHINES OFFER *Precision, Versatility and Speed*

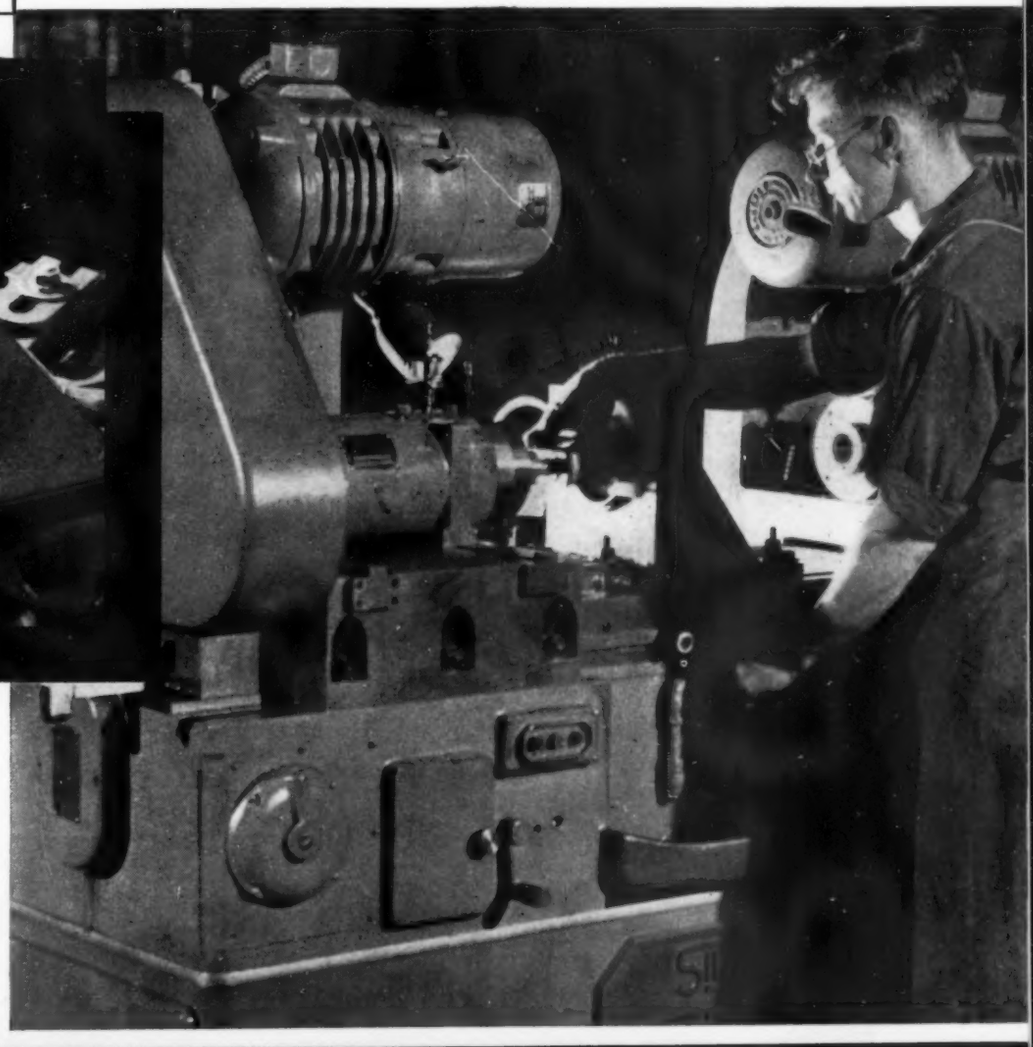
This Simplex Precision Boring Machine is designed for plants having a number of jobs of varying types to be handled by one machine. The bridges are made so they can be easily adjusted to suit the part being machined. A built-in electric facing control is provided with adjustable dwell.

END BRACKET PRECISION BORED IN 50 SECONDS

In this installation, an end bracket bore is machined to 1.0230" (+.0002", −.0001"). Boring Time is only 50 seconds. Finish is very smooth, and approximately 100 brackets are machined per tool sharpening.

Perhaps one of our 25 different basic models of Simplex Precision Boring Machines will serve you as well. Our engineers will be glad to make a study of your parts and production for faster and better precision boring. Send your part prints and production figures . . . no obligation.





FREE DATA

Write for these two booklets covering our complete line of precision boring machines. Complete specifications of each type are included. Ask for precision boring machine booklets.

STOKERUNIT CORPORATION
DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES
4524 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

IT'S WORTH LOOKING INTO...

The new Walker-Turner 20" Power-Feed Drill Presses are rugged production machine tools, designed to stand up to fast wartime manufacturing schedules. They have received rapid acceptance by industry because:

1. Careful design and modern manufacturing methods assure accuracy and the ability to maintain it even under the most strenuous production schedules.
2. Simplicity of design enables unskilled workers to produce acceptable work with a minimum amount of break-in time.
3. Flexibility is provided through the absence of unnecessary weight, yet they are heavy enough to withstand unintentional abuse by unskilled operators.

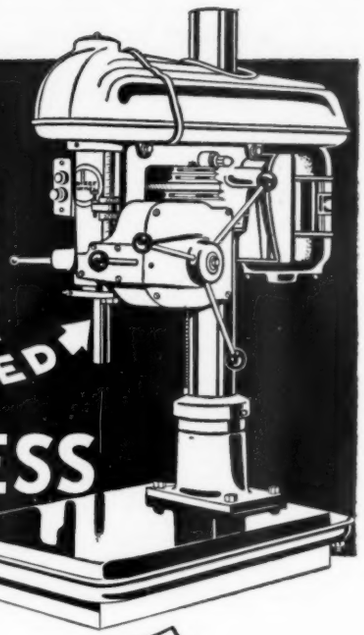
and besides;

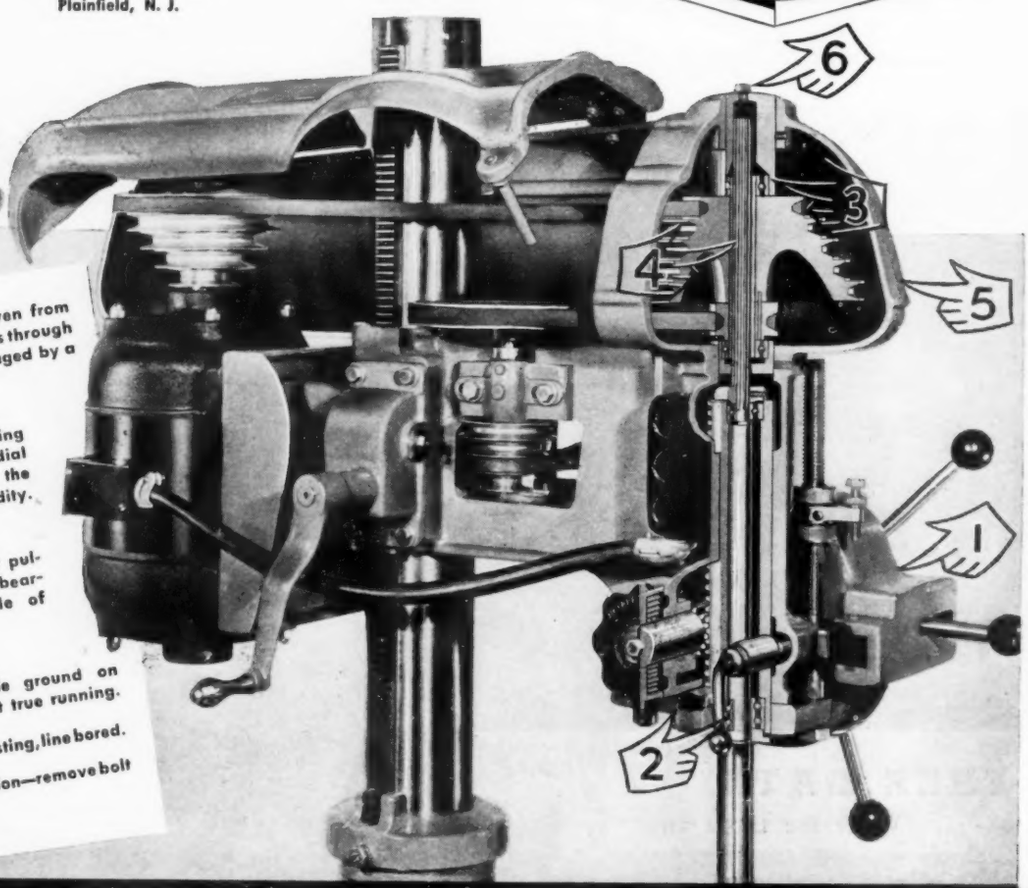
These fine machine tools are moderately priced and reasonably prompt shipments can be made to industries engaged in war production.

Send for descriptive literature.

WALKER-TURNER CO., INC.
Berckman Street
Plainfield, N. J.

The New
WALKER TURNER
POWER FEED
DRILL PRESS





1 Power-feed unit is driven from the spindle and operates through a worm gear. It is engaged by a multiple disc clutch.

2 Double Row Ball Bearing —for thrust and radial load. Placed close to the spindle nose for rigidity.

3 Mechanically correct pulley suspension. Ball bearings relieve spindle of all belt strain.

4 Ten spline spindle ground on centers to make it true running.

5 One piece head casting, line bored.

6 One shot lubrication—remove bolt and apply oil.

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

SCRAP SALVAGE
is a LAW *at* GREENFIELD

SO ACUTE is America's metal shortage — particularly of high speed tool steel — that today the importance of scrap cannot be overemphasized.

Industry has a responsibility it cannot evade, not only to *reduce* scrap-making in plants, but to *salvage* it to the last ounce. Even the tungsten from filings and sludge must be recovered and turned back into productive channels.

The GREENFIELD TAP AND DIE CORPORATION has assured our Government that a rigid plan of salvaging is now in force in every department of its plants. Even displays, historical pieces, test and "useful after the war" items must go.

What "*Greenfield*" is doing, must be done by every factory and shop throughout the country. Failure to carry out a scrupulous system of salvaging can almost be viewed as actual sabotage!

★ ★ ★

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD • MASSACHUSETTS
DETROIT PLANT: 5850 Second Boulevard
WAREHOUSES in New York, Chicago and Los Angeles
In Canada: GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

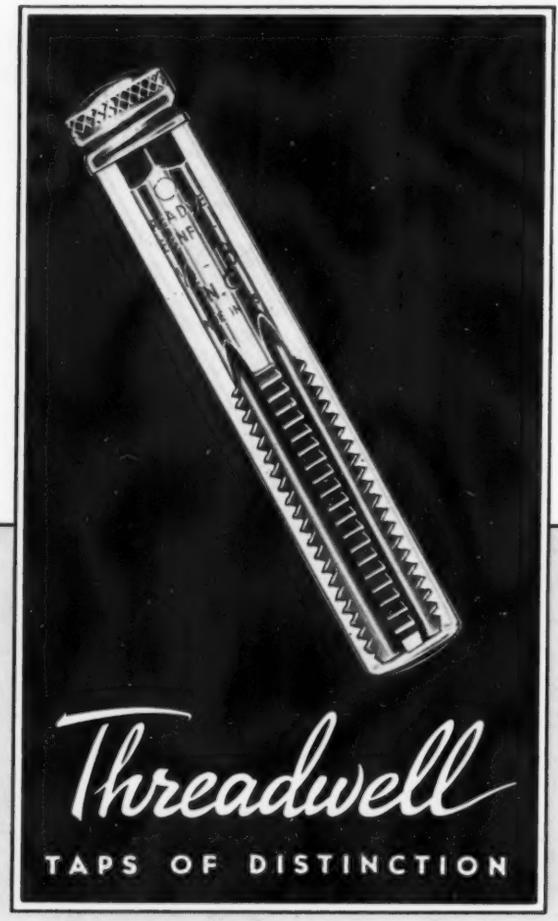
ARMY E NAVY

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES

A Plastic "Wrap"

FOR AN EXCEPTIONAL TAP



"PROTECTS THE TAP EN ROUTE"

"YOU CAN SEE THE SIZE WITHOUT UNWRAPPING"

"EASY TO STORE AND HANDLE"

"INSPECTED AND SEALED AT THE FACTORY"

One of the many things that Threadwell has done to insure better performance from taps is to pack every high speed tap under 1/2" size in a transparent plastic tube as shown.

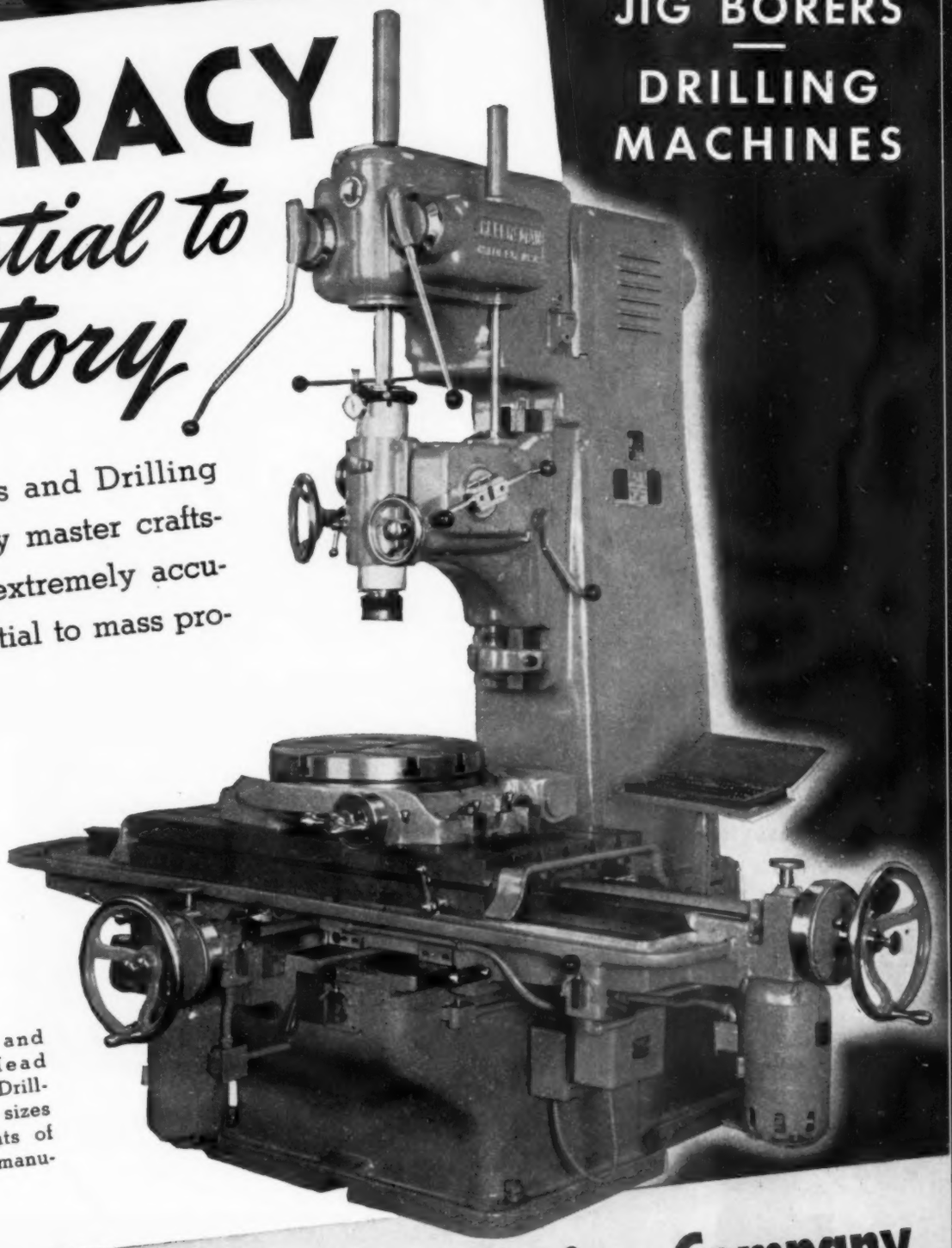
THREADWELL TAP & DIE COMPANY
GREENFIELD, MASSACHUSETTS
FOUNDED 1902

SALES AGENTS: *Canada* - BRIDGE MACHINERY COMPANY, *Montreal*. *England* - SKYLUX, LTD., *London*.

CLEEREMAN

JIG BORERS — DRILLING MACHINES

ACCURACY *– essential to Victory*



Cleereman Jig Borers and Drilling Machines are built by master craftsmen to perform the extremely accurate machining essential to mass production for victory.

★

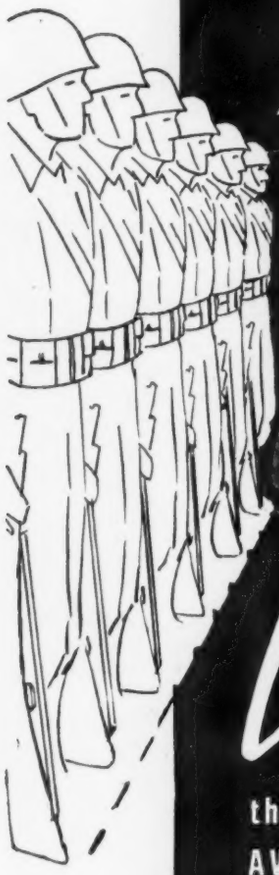
Cleereman Jig Borers and *Cleereman* Sliding Head Round, and Box Column Drilling Machines are built in sizes to meet the requirements of tool rooms and general manufacturing shops.

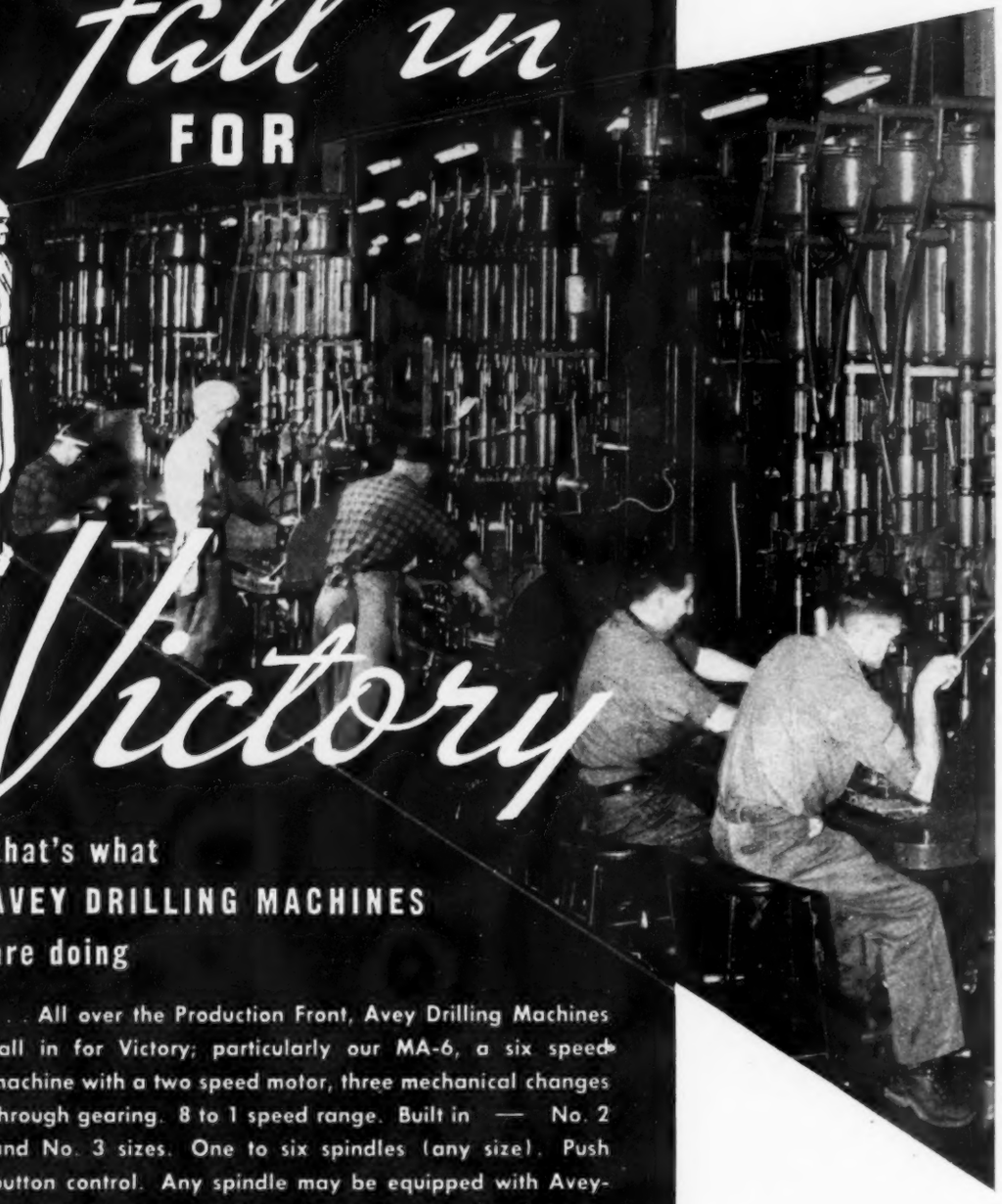
Bryant Machinery & Engineering Company

Sales Division of **Cleereman Machine Tool Co.**

400 W. Madison St. • • Chicago • Ill. • U. S. A.

Fall in FOR Victory





that's what
AVEY DRILLING MACHINES
are doing

. . . All over the Production Front, Avey Drilling Machines fall in for Victory; particularly our MA-6, a six speed machine with a two speed motor, three mechanical changes through gearing. 8 to 1 speed range. Built in — No. 2 and No. 3 sizes. One to six spindles (any size). Push button control. Any spindle may be equipped with Avey-matic Feed, or Reversing Motor Control for Tapping.

THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO, U. S. A.

Avey DRILLING MACHINES
CINCINNATI · OHIO

Helping *other* Manufacturers in a pinch makes it easier for your Distributor to help *You!*

Have you ever benefitted by some resourceful Distributor's *borrowing* of tools or supplies that neither he nor you had in stock on a particular day?

Knowing his territory as he does, the Distributor usually knows what manufacturer has a temporary surplus of what—and can spare a supply until the stock can be replenished.

You *always* need your Industrial Distributor—not just as a telephone number or street address, but as Chief Headache Absorber for your Purchasing-Expediting Department.

Your Distributor is trained to give you a hand on Priorities, too.

Draw on his experience for obtaining the supplies you need. It certainly will be the exception if you don't meet men of your own measure—in fact we are sure they *will* be.

These same Mill Supply Houses have served for many years as this Company's Distributors of Cle-Forge High-Speed Drills and Peerless High-Speed Reamers throughout Industrial America.

ARMY NAVY

Awarded May 22, 1942
Superseded July 13, 1942

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD.- 35-36-37 UPPER THAMES ST., E.C.4

ARMY E NAVY

Awarded August 8, 1942
★

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

SAVE TIME AND REDUCE REJECTIONS
....with the HARTFORD SUPER-SPACER

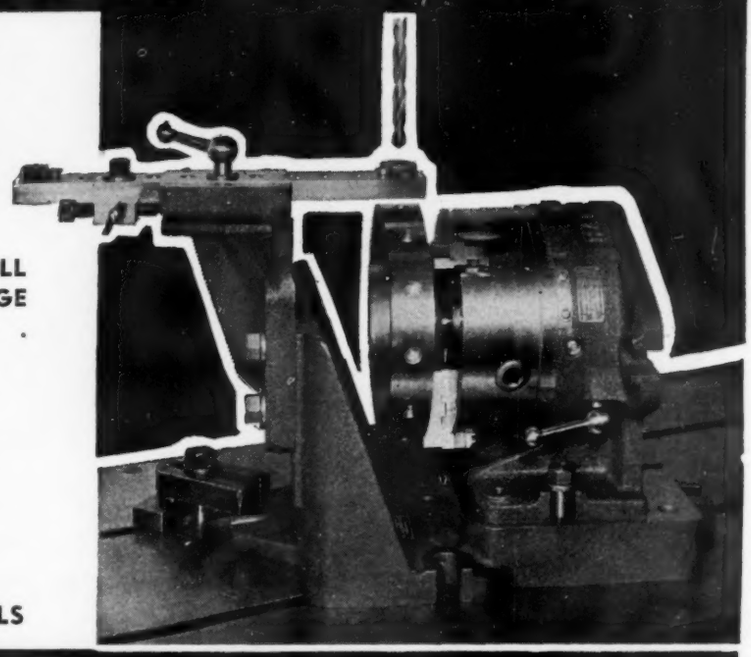
You can be assured of faster, better work from millers, drilling machines, slotters and planers when you use the HARTFORD SUPER-SPACER for indexing operations.

Work is not only held securely and heavy cuts made safely but chance of error is eliminated by mask plates. Indexing is extremely rapid and positive. Greater and more accurate production is assured even in the hands of unskilled operators.

THE HARTFORD RADIAL DRILL ATTACHMENT EXTENDS THE RANGE OF UTILITY . . . . . .

Secured to the SUPER-SPACER by a supplemental easily attached base, the HARTFORD RADIAL DRILLING ATTACHMENT provides a simple, practical means for handling radial drilling indexing operations. Variations in length and diameter in radial drilling can be easily handled. Set-up time is negligible. This attachment will fit any Hartford Super-Spacer and can be purchased at any time. It will enable you to get more work out of your "HARTFORD".

WRITE FOR FURTHER DETAILS



THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT

CARD TAPS

ARE YOU INTERESTED IN BETTER TAPPING?

If better production tapping is your objective, it will be to your advantage to come to Card. We can help you because we sell better tapping performance.

The high quality of work done—the quantity produced—the economy of using Card Taps—will be apparent on any tapping job. Just put Card Taps to work and let them prove their superiority.

A regular catalog tap in most cases will meet your needs without using special taps. You'll find your requirements covered in the Card Catalog No. 34. Write for a copy.

Card taps are sold by leading dealers everywhere

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO

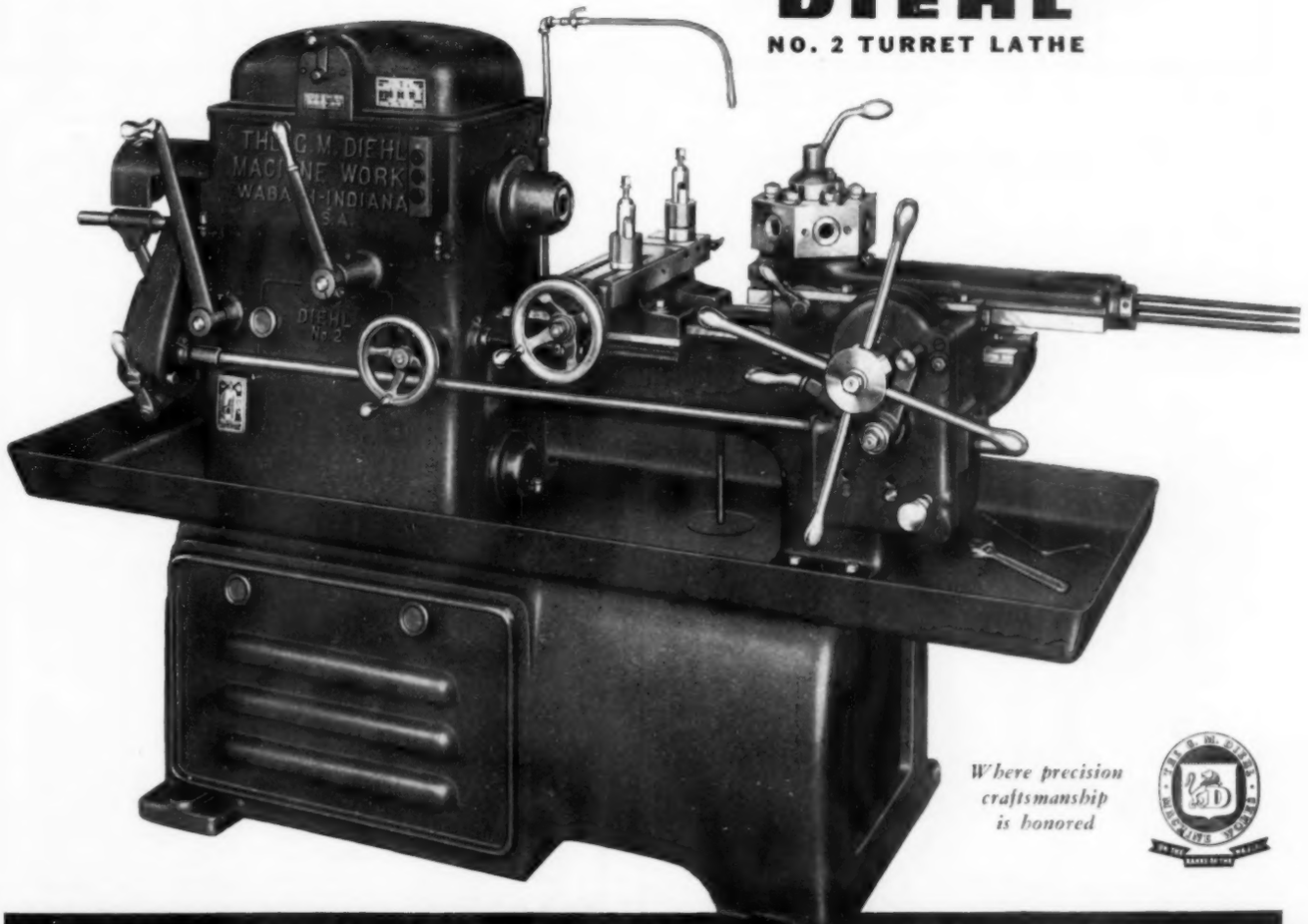
STORES: New York: 61 Reade St., Chicago: 11 South Clinton St, Detroit: 6540 Antoine St., Seattle: 568 First Avenue, South Los Angeles: 168 South Central Avenue San Francisco: 121 Second St.

★ DIEHL ★

POWERED for Wartime Production!

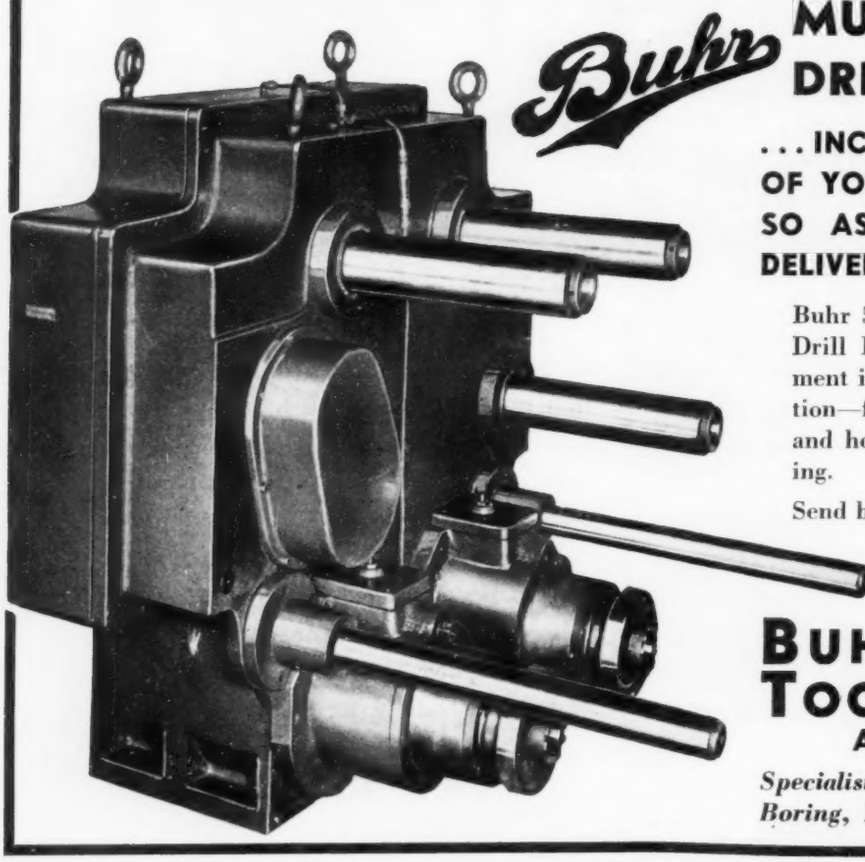
The new Diehl Power Feed Model No. 2 Turret Lathe embodies characteristics that make it ideal for shops busy on war contracts. It is backed by a name that is outstanding in the field of heavy woodworking machinery, and is the result of years of designing and producing quality precision machinery. Because of today's pressing need for turret lathes in war industries, the Diehl name is appearing in the metal working field. We are sure that it will be sustained by the performance of our product. The Diehl Power Feed Model works alongside any other No. 2 Turret Lathe of standard make, using same tooling, including collets. Automatic chuck capacity (round)—1″; swing—over cross slide, 6″, over bed, 14″. Six speeds, forward and reverse. For complete details write for brochure.

DIEHL
NO. 2 TURRET LATHE



Where precision craftsmanship is honored

The G. M. DIEHL MACHINE WORKS Wabash, Indiana



Buhr

MULTIPLE SPINDLE DRILL HEADS . . . .

. . . INCREASE THE PRODUCTION OF YOUR PRESENT MACHINES, SO AS TO MEET SCHEDULED DELIVERIES!

Buhr 5 spindle Horizontal Heavy Duty Drill Head—48" high—vertical adjustment in all spindles—oil pump lubrication—for 2 way machine—facing, boring and hollow milling holes in axle housing.

Send blue prints . . . we'll make suggestions and recommendations.

BUHR MACHINE TOOL COMPANY

ANN ARBOR, MICH.

Specialists in Multiple, Spindle Drilling, Boring, Reaming, Tapping Equipment.

ERRINGTON

Main Office and Works, Stapleton, Staten Island, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broadway

BOSTON
830 Old South Bldg.

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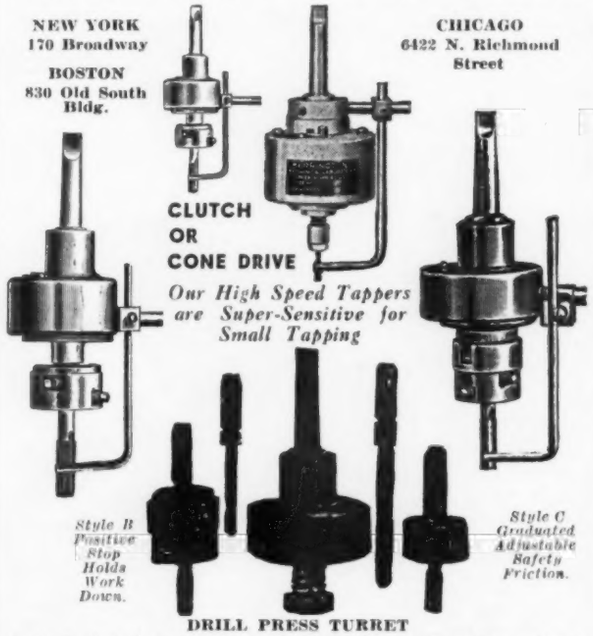
6422 N. Richmond Street



CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down.

Style C Graduated Adjustable Safety Friction.

DRILL PRESS TURRET

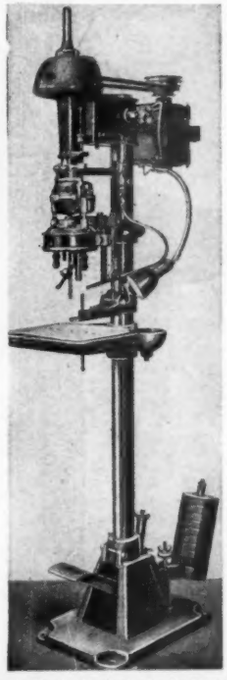
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder, if required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

YES—WOMEN OPERATORS TOO CAN DO FAST, ACCURATE TAPPING

on this

Ettco-Emrick
FOOT-OPERATED TAPPING MACHINE



The skill usually needed in tapping is built into this machine with its hair-trigger sensitive friction clutch and sensitively counterbalanced foot pedal. All the operator has to do is place the work and step on the pedal. That's why practically any operator, male or female, can maintain a production of **2400 accurately tapped holes per hour** with the standard 2-spindle head —and up to **12,000 holes per hour** with available Ettco-Emrick Multiple Tapping Heads.

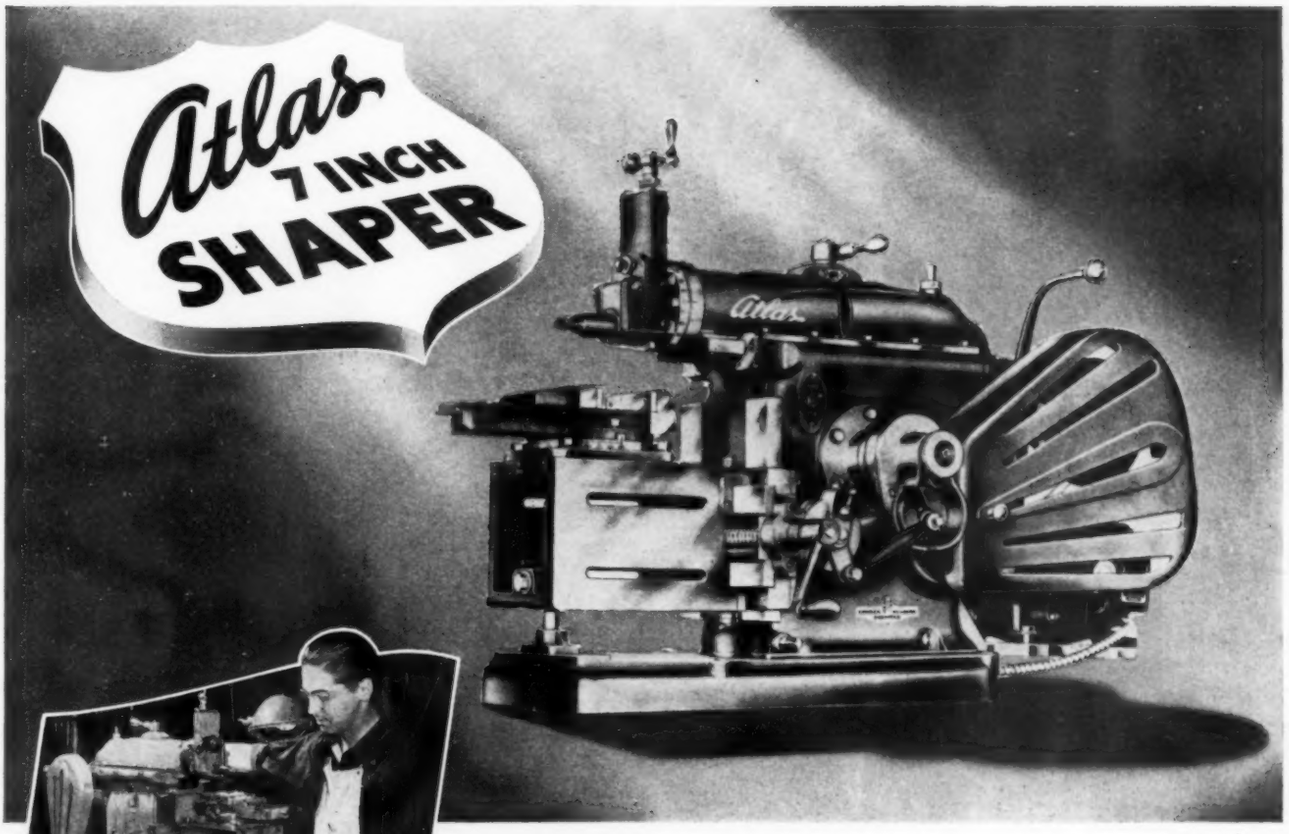
BULLETIN No. 4 gives full details about the Machine and

BULLETIN No. 3 covers the Multiple Tapping Heads.

Copies Mailed to You on Request

ETTCO TOOL CO., Inc.
590 Johnson Ave., Brooklyn, N. Y.
Detroit • *Chicago*

MAKERS OF Ettco-Emrick DRILL CHUCKS • TAP CHUCKS
MULTIPLE TAPPING AND DRILLING HEADS
TAPPING ATTACHMENTS • TAPPING MACHINES



In [redacted] tool room, the Atlas Shaper makes snap gauges, small tools, and commutator dies.

"Match the Machine to the Job" for Top Production

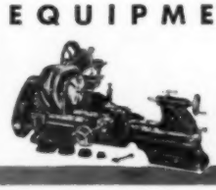
That fundamental idea — "Match the Machine to the Job" is an important reason why American war producers are forging to the front in the battle of production. The massive jigs and huge assemblies are monuments to American ingenuity and production power.

Just as important are the fast precision tools that *take over the production of small parts* so that the capacities of larger machines will not be wasted. The Atlas 7" Shaper is one of these valuable smaller tools. It handles everything within a 7" stroke. It is a counterpart of the larger shapers in precision, production and power, and is more flexible in set-ups. 5 automatic cross feeds in either direction and four speeds between 45 and 200 strokes per minute give a wide operating range. It has a complete V-belt drive, crank-type bull-gear drive, and operates from a ½ HP 1740 RPM motor. You will find Atlas Shapers in many of the plants that are winning "E" awards. Send for complete information. Atlas Press Company, 1104 N. Pitcher St., Kalamazoo, Michigan.

Atlas
ATLAS PRESS CO.
KALAMAZOO, MICH.
U. S. A.

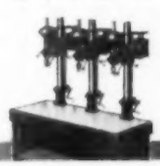
OTHER ATLAS EQUIPMENT FOR WAR PRODUCTION

MILLING MACHINES
Compact, powerful bench millers for full range of milling work from slabbing and facing cuts to end milling, finishing.



LATHES
F-Series 10" Lathes with turret attachments and lever collet chuck are breaking the bottleneck of screw machine part production.

DRILLING MACHINES
Step up production, cut costs on small-hole drilling, tapping. Massive production oil table, solid floor legs. 4-, 3-, and 2-spindle models.



High Productive Capacity on Long or Short Runs—

The Adams Gear Hobber & Thread Miller

Accessibility of the work for rapid changing and simplicity of setups reduce idle time and make this a very convenient machine for short runs, just as its rigidity and precision make it desirable for production work.

Spur gears, helical gears, splined shafts, sprockets, ratchets and multiple threaded worms can be handled most economically by the hobbing method.

Worms, lead screws and feed screws, single or multiple threaded, can be produced by thread milling.

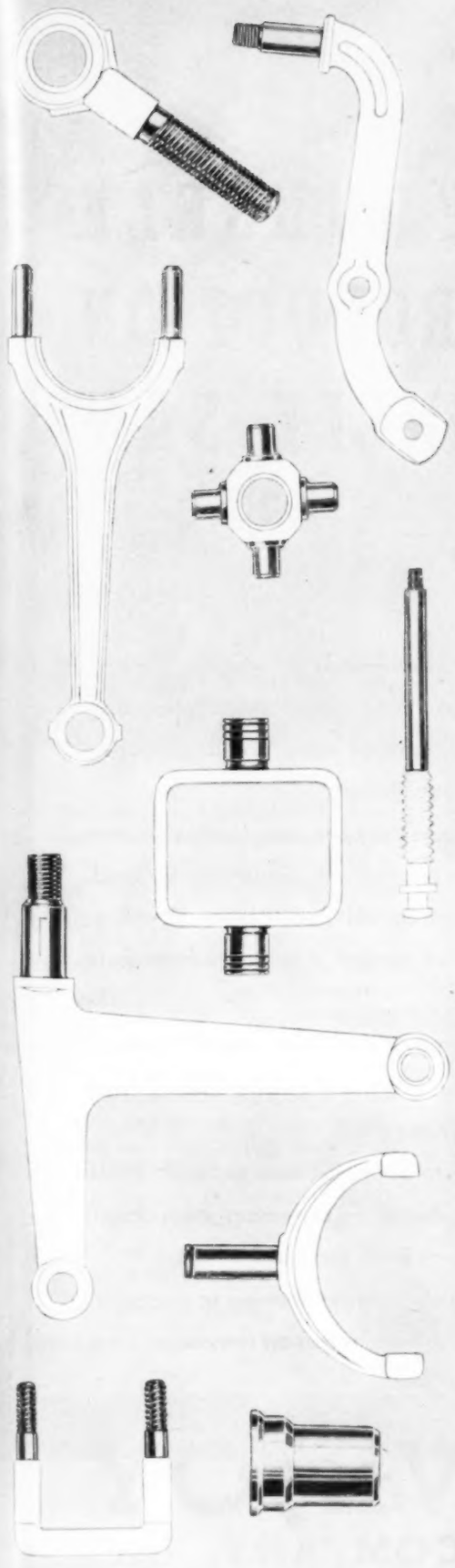
Capacity—10" diameter, 24" and 48" between centers. For high production of spurs and splines, investigate the Adams Manufacturing Hobber; capacity 8" diameter, 24" and 48" between centers.

Ask for Catalog No. 501.

THE ADAMS COMPANY

1883 — Our 59th Year — 1942

1905 Bridge Street **Dubuque, Iowa, U.S.A.**



Hollow Mill THREE TIMES Faster

4 chips at each pass

1 chip at each pass

WITH NAMCO CIRCULAR TYPE MULTIPLE CUTTER SELF-OPENING HEADS

On vital war parts like these, the 3 to 1 advantage of circular mills over single point tools shows a big saving in *cutting time alone*. But you save much more than that:

After grinding one or more single point tools, you must adjust each tool to cut its individual diameter, radius or shoulder. This takes time and often wastes product.

Compare with this — to sharpen a set of circular mills you check them to a predetermined micrometer gage reading, replace them in the head, and one simple *adjustment* brings all four to exact cutting size. No fussing for sizes, no experimental scrap loss.

These Self-Opening Hollow Mill heads also shorten the time cycle — snap open at end of cut, avoid "step" marks and insure uniform finish.

And don't forget this: Circular tools give you 10 times more cutter or chaser life, and you can hollow mill and thread with the same head simply by changing circular mills to circular chasers with chaser blocks — "Double Duty" tools.

Ask for Catalog D-42

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

How to HELP YOURSELF HELP PRODUCTION HELP UNCLE SAM

NEW
A new Lovejoy blade

SAVE
Still plenty of life left

SCRAP.
Sell blades like this to Uncle Sam — he needs them

Lovejoy Milling Cutters, with *positive-locking* Lovejoy Blades, have been outstanding in their field continuously for the past 28 years. Now, more than ever, Lovejoy users are appreciating especially Lovejoy's advanced blade design.

Lovejoy blades HELP YOU because they are *interchangeable* over a wide range of sizes. More than one-half the blade may be used. All standard sizes of blades in High Speed Steel, Stellite, Rexalloy, and Cemented Carbide blades are carried in stock for immediate shipment.

They HELP PRODUCTION because they last longer between grinds. They may be resharpened easily and quickly. They require less power on heavy feeds at high speeds.

When your blades are ready to scrap, be sure to HELP UNCLE SAM by selling them to your junk dealer — remember, High Speed and other alloy steels are scarce — keep them in the fight.

Worn out Cemented Carbide blades may often be salvaged by using Lovejoy's retipping service — information on request.

LOVEJOY
TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U.S.A.

5-SPINDLE HEAD *Multiplies* SHELL OUTPUT

★ This new multiple spindle head designed and built by Kent-Owens mills all five staking notches in a typical shell at the same time. This method greatly multiplies production over the former method of milling one notch at a time. Both actual machining time and handling time are reduced to a fraction of that formerly required.

The fixture shown is designed so that shells are rolled on to it from an adjoining conveyor, completely notched, and then rolled back onto the conveyor. This unit can be adapted for use on either a Kent-Owens No. 1-8 Machine with hydraulic feed to the table, or the No. 1-M with hand feed.

Write for details.

KENT-OWENS MACHINE CO., TOLEDO, O.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
rd Machinery Corporation
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DALLAS
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A. C. Haberkorn Machinery Co.
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J. F. Owens Machinery Company
TORONTO
F. F. Barber Machinery Company
WALKERVILLE
F. F. Barber Machinery Company

Call on KENT-OWENS *for Milling Machines*

Planers

OPEN SIDE DOUBLE HOUSING HEAVY DESIGN

Ready soon

You can get a new Liberty Planer! Perhaps sooner than you expected! We have a few which will be ready for delivery in the very near future. Dependent upon the style and size you need, your planer can be delivered in from three to seven months!

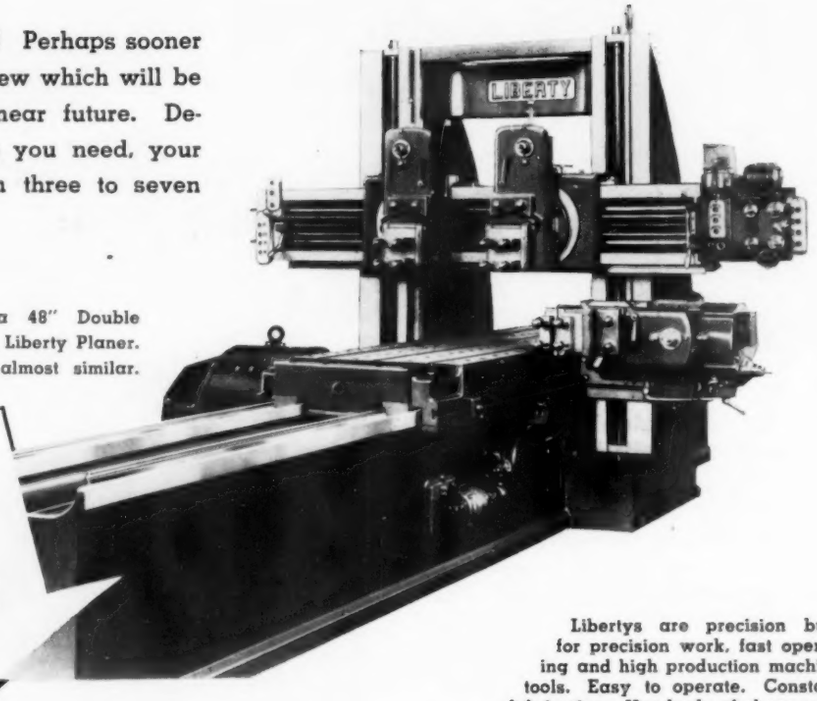


Illustration shows a 48" Double Housing Heavy Duty Liberty Planer. Medium Duty type almost similar.

QUICK DELIVERIES

Libertys are precision built for precision work, fast operating and high production machine tools. Easy to operate. Constant lubrication. Hundreds of shops now operating under war schedules are attaining maximum results with Liberty Planers.

DELIVERY—THREE TO FOUR MONTHS.
48"x48" Double Housing Medium Duty Planers with 12, 16 or 20' tables.

DELIVERY—SIX TO SEVEN MONTHS
72"x72"x20' Double Housing Heavy Duty Planers.

DELIVERY—FIVE TO SIX MONTHS
42"x42"x12' Open Side Heavy Duty Planers.

DELIVERY—THREE TO FOUR MONTHS
30"x30"x10' Open Side Standard Duty Planers.

DELIVERY—THREE TO FOUR MONTHS
24"x24"x8' Open Side Standard Duty Planers.

Consult our nearest representative or factory direct for information and data on planers.

LIBERTY PLANERS

1006 WELLER AVE. **HAMILTON, OHIO**

A flexible machine that is the last word in simplicity of operation

HI-SPEED
HONING and LAPPING MACHINE

for use with any standard make honing head

Illustrated is No. 0 Machine equipped for 36" stroke with 80" under the spindle.

HONES CYLINDERS up to 24" in diameter . . . with STROKES from 20" to 72" . . .

IDEAL FOR PRODUCTION JOBS INVOLVING:

Aircraft parts . . . Ordnance parts . . . Diesel engines . . . Compressors . . . Pumps . . . Internal combustion engines . . . Steam cylinders, etc.

Speed up war work involving internal cylindrical surfaces by utilizing a HI-SPEED Honing Machine. When used with proper honing head of any standard make, the HI-SPEED machine produces accurate, straight, round, smooth bores—amazingly fast.

Unique positive stop and dwell system makes it possible to stop the spindle without shock or impact at the bottom of each stroke, at any point within the stroke range and hold the spindle without reciprocation, at that point up to 1½ minutes. Ideal for "blind hole" honing and straight line lapping or honing.

All controls are located at the front of the machine at the operator's station . . . No ladders to climb . . . Stroke setting, hone withdrawal, short stroking at any point, changes in speed of reciprocation or rotation of the spindle made instantly from operator's station.

The HI-SPEED Honing Machine is made in 4 sizes, any one of which can be had with strokes up to 72"... Designed for use with any standard make of honing head.

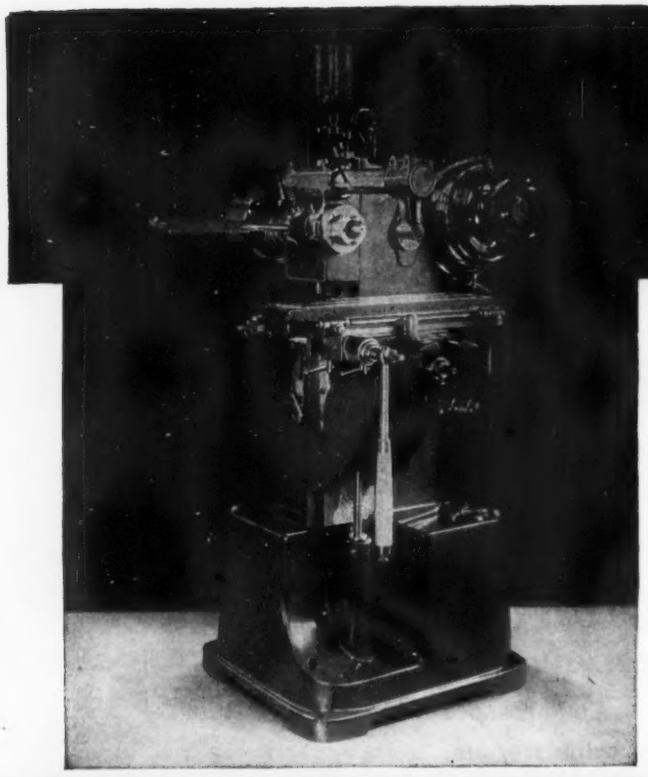
Tell us your requirements—and our engineers will promptly furnish you with complete information, prices and early delivery dates.

NOTE THESE SPECIFICATIONS:

Model No.	No. 0	No. 1	No. 2	No. 3
Stroke (standard)	20"	36"	48"	72"
Working Base Area (standard) . . Auxiliary Tables available	21" x 22"	31" x 31"	31" x 31"	48" x 54"
Height Under Spindle Nose (up) . . Added Height Available on Order.	48"	60"	75"	100"
Spindle Diameter	2¼"	2¾"	2½"	2¾"
Spindle Speeds Through Gear Box	4	4	4	8
Main Drive Motor (standard)	7½ hp	10 hp	15 hp	20 hp
Coolant Pump Volume, Motor Driven	14 gpm	18 gpm	18 gpm	25 gpm
Maximum Bore possible to hone with standard spindle drive motor	10" Dia.	12" Dia.	16" Dia.	20" Dia.
Maximum Overall Diameter of Cylinder possible to place on standard base	18"	27"	27"	44"
Floor Area	44"x60"	60"x80"	60"x60"	60"x108"
Overall Height	11'6"	15'3"	18'3"	23'8"

NOTE: Under our new policy of distribution, sales territories are being assigned to financially responsible, established dealers in the machine tool field. A few excellent territories are still open, and dealers are cordially invited to write us relative to sales representation.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Avenue, North Chicago, Illinois



THE NICHOLS HAND MILLER

» A modern, convenient machine for the volume production of accurate parts . . . .

In the "NICHOLS", the usual features of the hand miller have been combined with a ruggedness of design and construction which makes it a truly production machine tool offering high cutting speeds, maintained precision and long life. A wide variety of operations can be handled at top speed and reduced cost as compared with the same work produced on larger slower machines.

Because of its precision, great versatility and quick set-up, the Nichols Hand Miller is particularly adapted to tool room requirements. Its wide use in this class of service by leading manufacturers is evidence of its recognized value and suitability in meeting the requirements of modern shops.

•

Capacity: Longitudinal Feed, 10"; Transverse Feed, 7"; Vertical Feed of Knee, 13½"; Vertical Movement of Head, 4½", Working Surface of Table, 6½" x 21"; Spindle Speeds, 100, 200, 600 and 1200 R.P.M.

Send for Illustrated Bulletin giving Complete Information

W. H. NICHOLS & SONS *Waltham, Mass., U.S.A.*

FRACTIONAL HORSEPOWER?

NOT IN A VERNON!

It takes plenty of power to remove metal. It takes extra power to meet special occasions—not "just enough" for the job, but a substantial reserve that lets you go zipping through the deep cuts . . . the tough metals . . . allows use of a large diameter cutter—a reserve that provides maximum cutting efficiency under any circumstances!

That's why Vernons have a full horsepower motor. No stalling on time-saving cuts—no babying through the extra tough ones. Ample speed and power for any metal removing necessity!

See the Vernon No. 0 Horizontal Mill at your dealers —over 70 sales locations in the United States! Bulletins available on request.

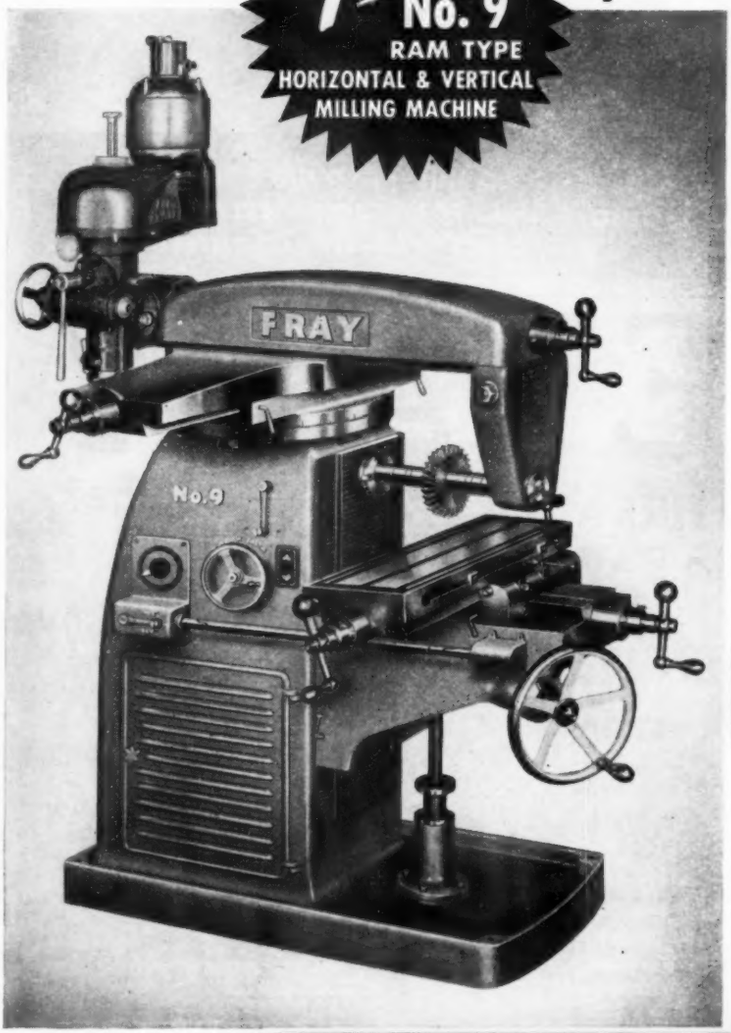
MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON LOS ANGELES, CALIFORNIA
Vernon Line of **HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS**

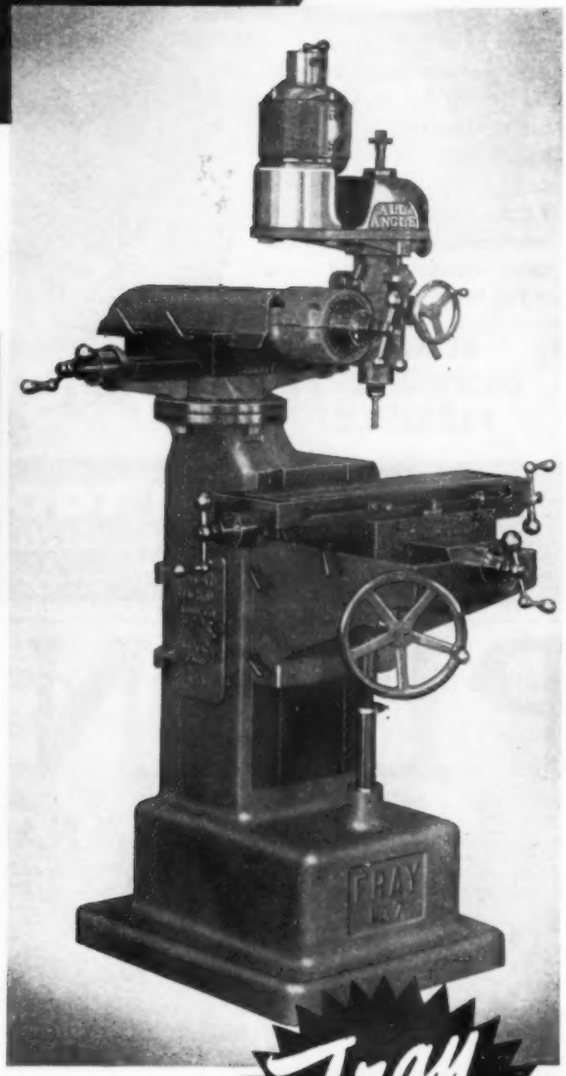
TWO VITAL TOOLS
for speeding war production

Featuring ALL THE FLEXIBILITY OF A RUBBER HOSE *plus* EXTREME RIGIDITY & UNEQUALLED RANGE

VERTICAL HORIZONTAL

Fray No. 9
RAM TYPE
HORIZONTAL & VERTICAL
MILLING MACHINE





All-Angle

Fray No. 7-B
RAM TYPE
VERTICAL
MILLING MACHINE

★ *Write for descriptive literature on either or both machines*

FRAY MACHINE TOOL COMPANY
517 W. WINDSOR • GLENDALE, CALIFORNIA

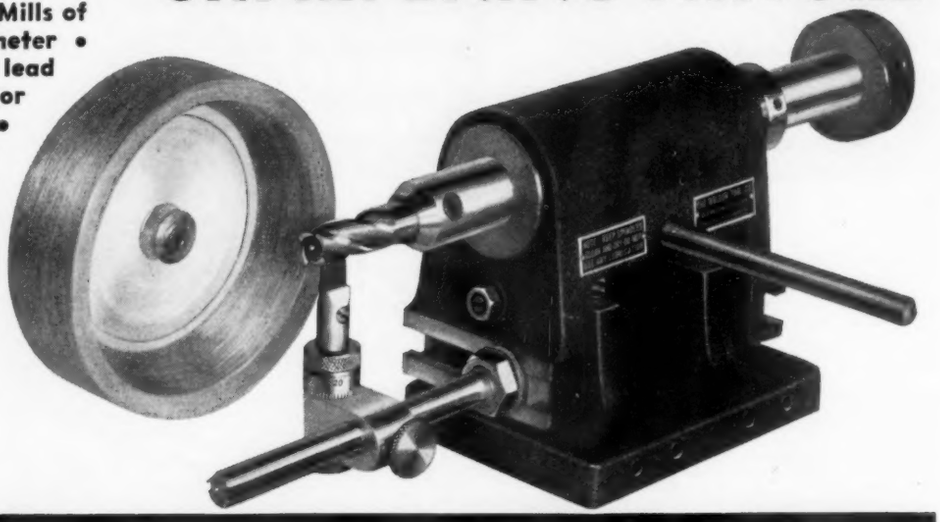
END MILLS ARE SCARCE...MAKE 'EM LAST

Use your WELDON SHARPENING FIXTURE

COMPLETE!
SELF-CONTAINED!

Quickly re-sharpens End Mills of 3/16" to 1¼" shank diameter • Requires no centers or lead cams • Releases major production equipment • Designed for any grinder with flat table • No table movement necessary • Operated by trained or unskilled workers • Provides tool conservation — a vital war factor.

SIMPLE!
CONVENIENT!
FLEXIBLE!

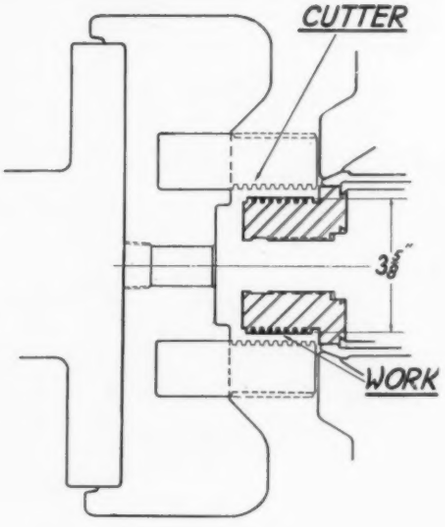


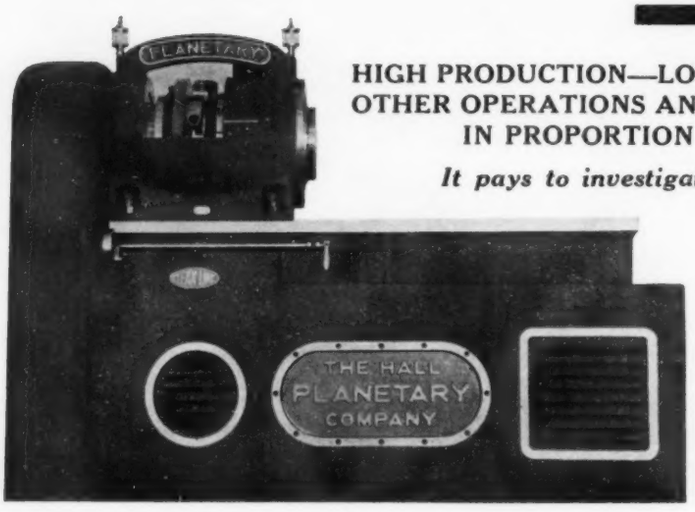
THE WELDON TOOL CO.
3002 WOODHILL ROAD • CLEVELAND, OHIO
"Yesterday's Pioneer — Today's Leader"

END MILLS • GROUND CIRCULAR AND FLAT FORM TOOLS • SCREW MACHINE CAMS • "TU-LIP" COUNTERBORES

PLANETARY

PLANATHREAD THIS PART IN 6 MINUTES



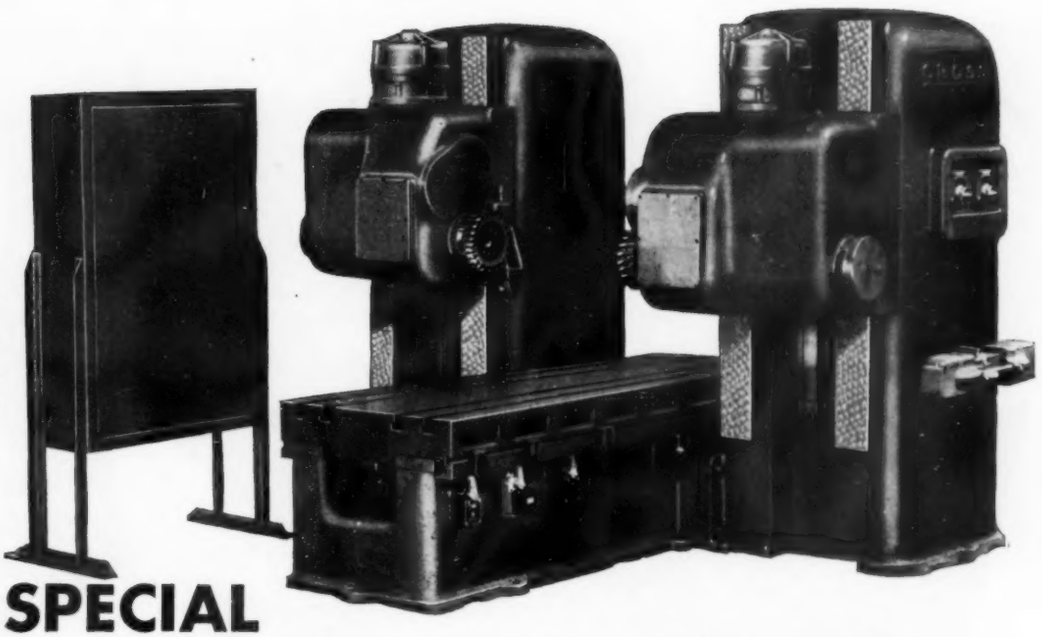


HIGH PRODUCTION—LOW COST
OTHER OPERATIONS AND SIZES IN PROPORTION

It pays to investigate

Send us prints for details

THE HALL PLANETARY COMPANY
Fox Street and Abbotsford Avenue
PHILADELPHIA, PA.

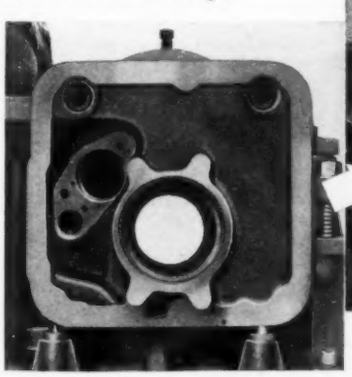


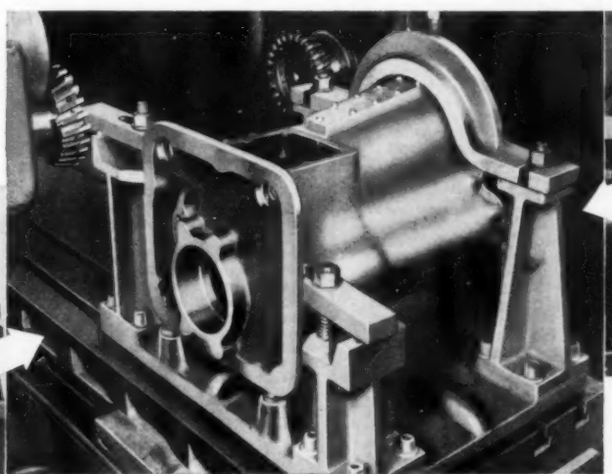
Available in combinations including: any width and length of table and bed, one or more side columns and heads, cross rail with one or more heads containing vertical or angular spindles.

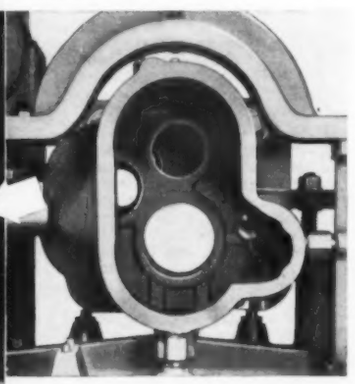
CROSS SPECIAL
Automatic Duplex Miller

Modern production shops are achieving noteworthy results with the Cross Automatic Miller on diversified classes of work. Hydraulic feed and rapid traverse, with independent electric controls for each head and the table, provide a means for quick set-up and assure a range of flexibility to meet the most exacting requirements. Each head is a self-contained unit with individual motor drive, quill adjustment for the cutter spindle and pick-off gears for changing cutter speeds. The automatic operating cycle is an important contributing factor in maintaining volume production schedules with unskilled help.

One cutter finishes the irregular profile of the large flange, on the left end of the case, as illustrated below. Note the necessity of finishing between the stud bosses of the smaller flange.







A second cutter finishes the irregular profile of the flange on the right end of the case, as illustrated above.

On the cast iron gear box illustrated above—both ends, each entirely different than the other, are automatically finished at the same time and in one operation with the Cross Duplex Miller.

CROSS GEAR & MACHINE CO.

Established in 1898

DETROIT, MICHIGAN, U.S.A.

S-3

The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
With
Foreign and Domestic
THREAD SYSTEMS

CONTENTS

Definitions * Thread Series * Fits (Description) * Marking Symbols * Stockable Chaser Sizes * coarse Thread Series—Basic Dimensions * Proposed National Extra Fine Thread Series * 27 Pitch Lighting Fixture and Brass Tubing Threads * Fine Thread Series — Basic Dimensions * Tolerances for Screws and Nuts Class 2 and 3 * 8, 12 and 16 Pitch Series * Class 2 Tolerances for Coarse and Fine Thread Series for Screws and Tapped Holes * Tap Drill Sizes for National Coarse and Fine Threads * American National Pipe Threads—Straight Pipe Threads * Acme Threads * Stub Acme * SAE Fuel, Oil and Tube Fitting Thread * Stub 60° Thread * Spark Plug Thread Sizes.

British Standard Whitworth * British Standard Fine Thread * British Association Thread * Cycle Engineers Institute Thread * British Standard Pipe—Taper and Straight * International Metric Thread * French Standard Metric Thread * French Standard Thread * Lowenherz Thread—Decimal Inch Equivalent of Millimeters * Equivalent of Metric Pitches in Inches and Threads Per Inch * Three Wire System of Measuring Threads * Decimal Equivalents * Single and Double Depths of American National Whitworth and V Threads Compared * Cutting Speeds—Surface Feet * Weight of Bar Stock Per Foot * Guide for the Design and Purchase of Screw Machine Products * SAE Steels (Analysis) * Comparison of British and American Nickel Alloy Steels.

FREE to Factory Executives
who request it on a business letterhead;
others, 15 cents.

H&G DIE HEAD

The Eastern Machine Screw Corp.
Manufacturers of H & G Die Heads
20-40 Barclay St. **New Haven, Conn.**

Precision parts and assemblies for automatic time and contact fuzes, are produced COMPLETE PER STROKE on Dieing Machines at far greater speeds than ever before.

Producing stamped parts Faster - Better Cheaper

Dieing Machines make intricate ammunition parts COMPLETE PER STROKE

Machine gun belt link produced complete one per stroke to extreme precision limits at exceptionally high speed.

Cartridge clip for caliber .303 rifle produced complete one per stroke at record-breaking high production.

INCLUDING BROACHING

Airplane fuselage hinge of duralumin produced complete per stroke in continuous strip to high precision including BROACHING.

The split-second functioning of a time fuze; the delicate action of a contact fuze so sensitive as to detonate on meeting fabric; the flawless functioning of cartridge clips and machine gun belt links —for these and many other ordnance purposes, Dieing Machines are producing stampings of surpassing accuracy at amazingly high speeds. Producing 1 to 20 completed parts per stroke from flat material, one Dieing Machine equals 5 to 10 conventional presses. What is more, this unique press has WIDENED THE SCOPE of stamping, replacing screw machine production and performing unusual and difficult operations foreign to stamping—all at greatly increased production and with precision of product to .0002" when required. Capacities: 10 tons to 300 tons. EXPERIENCED MUNITIONS STAMPING COUNSEL, YOURS FOR THE ASKING!

Request Catalog 42

Making scores of Munitions Items at new high rates

STAMPINGS
- Machine gun belt links
- Mechanical time and contact fuze parts
- Rifle components
- Cartridge clips, or rifle chargers
- Gas mask stampings
- Ammunition stampings
- Bomb components
- Shell parts
- Detonator stampings
- Airplane instrument, engine and fuselage parts

OPERATIONS
- Bullet assembling
- Primer inserting
- Automatic time and contact fuze assemblies

THE HENRY & WRIGHT MFG. CO.
489 Windsor St. **Hartford, Conn.**

Henry & Wright Dieing Machines

FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW

Get This Flag Flying Now!

This War Savings Flag which flies today over companies, large and small, all across the land means *business.* It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow,* keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Payroll Savings Plan, *now is the time to do so.* For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW., Washington, D. C.

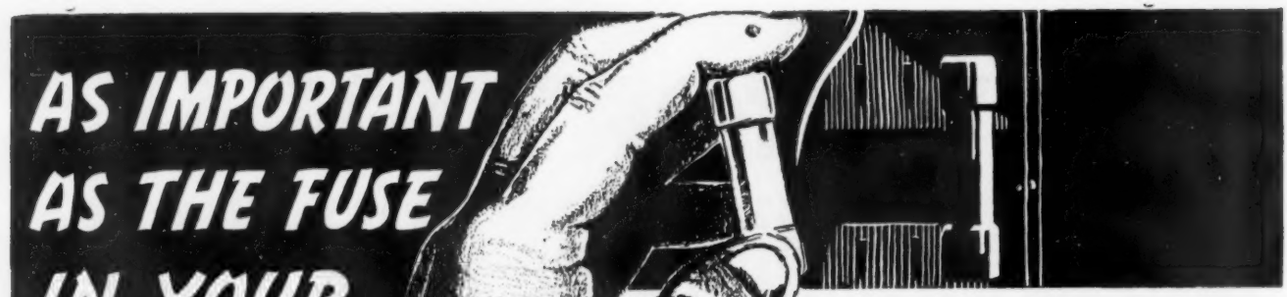
EVERYBODY EVERY PAYDAY AT LEAST 10%

Save With

War Savings Bonds

This Space Is a Contribution to America's All-Out War Program by

AMERICAN MACHINIST



AS IMPORTANT AS THE FUSE IN YOUR POWER LINE--

SAFETY SLIDE IN THE FERRACUTE *Automatic* PIN CLUTCH

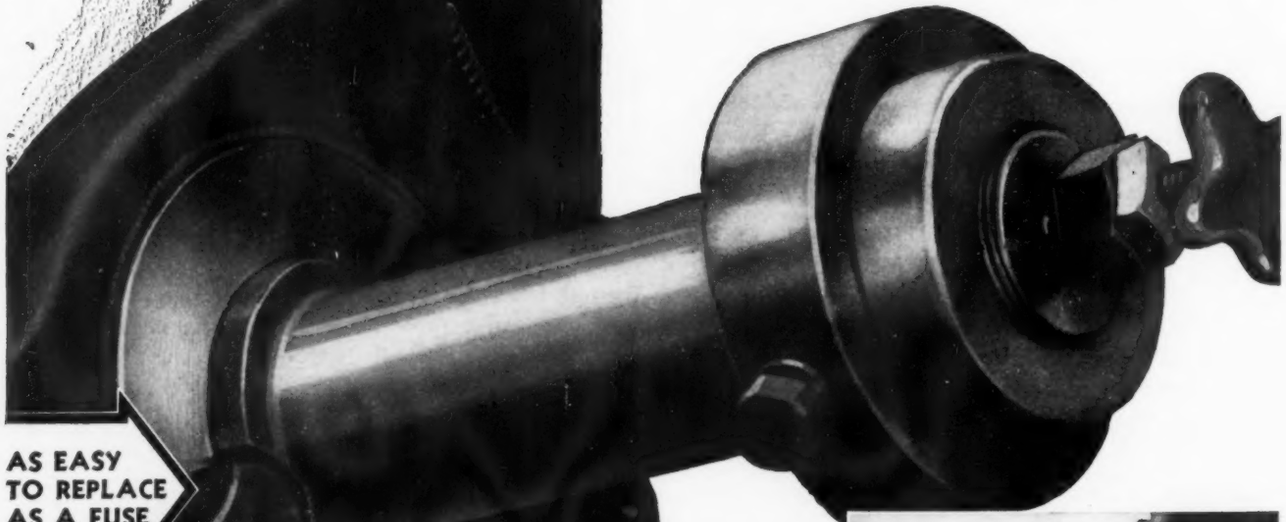
The Clutch Slide or Driving Dog on the Ferracute Automatic Pin Clutch is a specially engineered SAFETY DEVICE. Made of Alloy Steel, carefully heat treated, the Slide will give you years of service under normal conditions. It is designed, however, to break when the press is dangerously overloaded---thus preventing more serious damage to press, dies, or to operator.

The Safety Slide does the same job as the fuses in your power line---and is as easily replaced since it is round and can, in an emergency, be made in any machine shop. It is one more engineering feature that keeps FERRACUTE presses on the firing line without interruption.

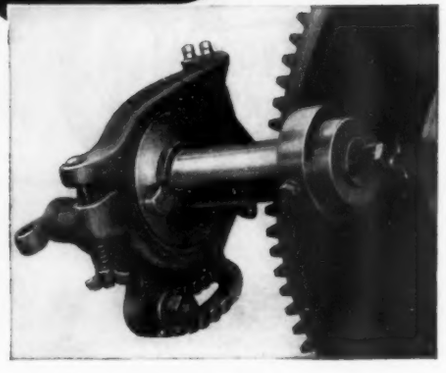
The Ferracute Automatic Pin Clutch is a complete, compact unit of clutch and brake assembled together---an exclusive feature, found on no other press. It is standard equipment on all the small and medium sizes of the famous FERRACUTE PRESS line.

FERRACUTE MACHINE COMPANY

Bridgeton, New Jersey, U. S. A.

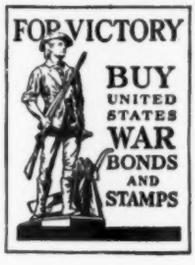


AS EASY TO REPLACE AS A FUSE

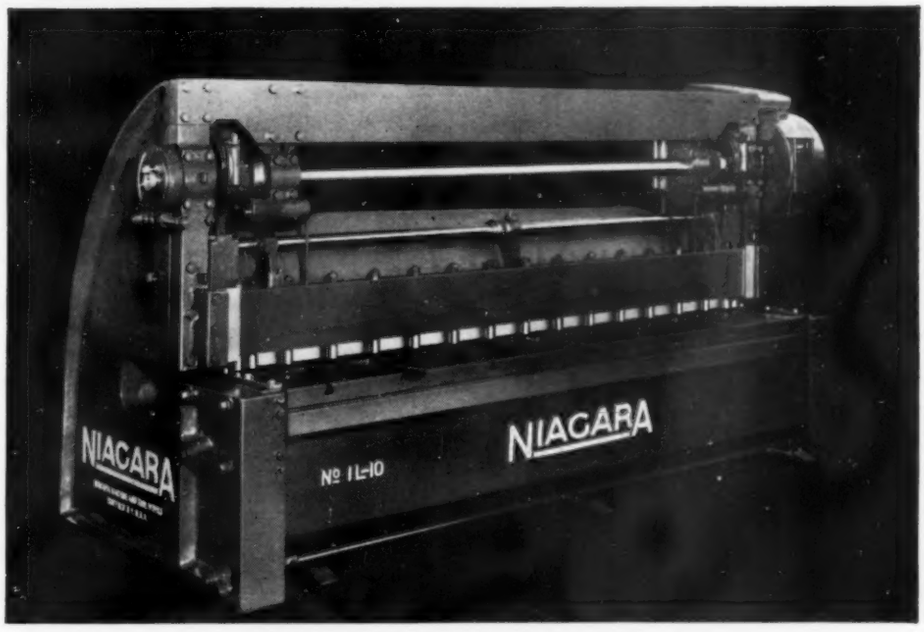


TRADE FERRACUTE MARK

PRESSES *and* PRESS BRAKES



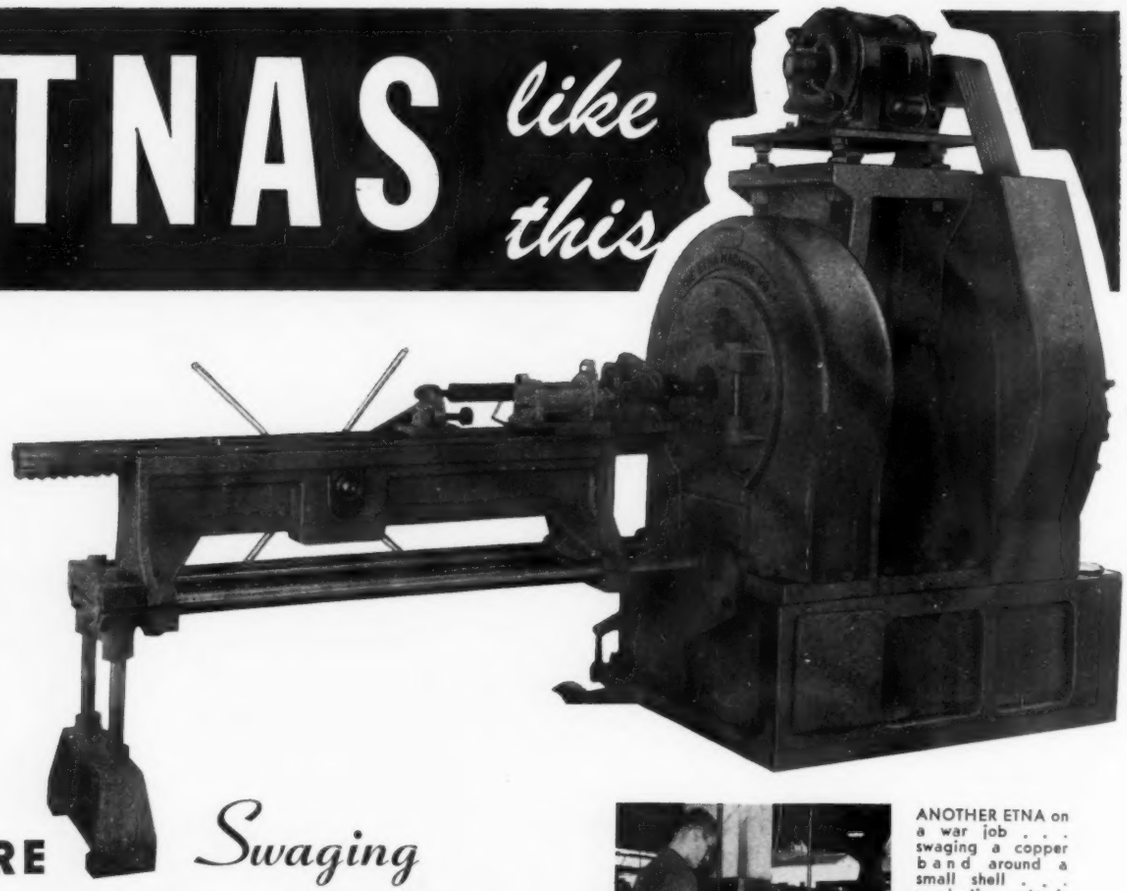
Production machines as well as fighting machines must be tough. Reliability built into Niagara Presses and Shears is standing the gaff during 24-hour-a-day, 7-day-a-week wartime requirements. Leading American manufacturers of tanks, ships, airplanes, and other fighting equipment are depending on Niagara.



NIAGARA MACHINE & TOOL WORKS, BUFFALO, N. Y.

District Offices: Leader Bldg., Cleveland — General Motors Bldg., Detroit — 50 Church St., New York

ETNAS *like this*



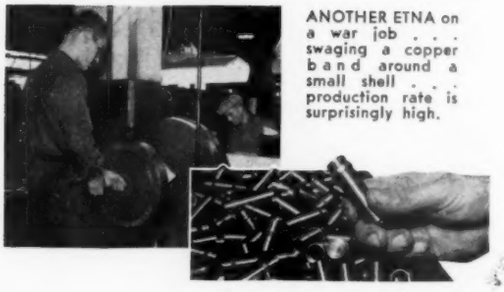
. . . ARE *Swaging* WAR PRODUCTION JOBS

ECONOMICALLY . . . SPEEDILY . . . EFFICIENTLY!

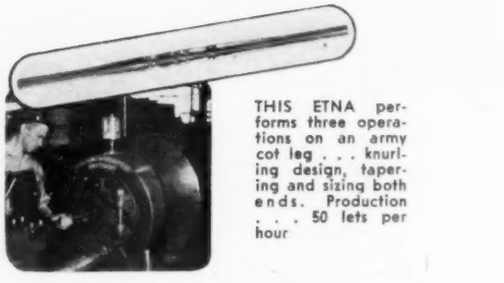
● Have you thoroughly investigated swaging as a cheaper, faster, more efficient method of handling your war production jobs? Here are two examples, showing how alert manufacturers have employed standard ETNA Swaging Machines on special war-time jobs . . . to turn these jobs out in the best possible manner.

It's well to remember . . . with swaging, you can often eliminate machining operations . . . improve quality . . . increase output.

If you taper, size or reduce round solids or tubing . . . if you handle small tubular assemblies . . . look to swaging by ETNA. Swaging Machines by ETNA are built in standard sizes with die lengths up to 18", and diameters up to 8". Larger units are built to order. Want complete details? . . . write, wire or phone!



ANOTHER ETNA on a war job . . . swaging a copper band around a small shell . . . production rate is surprisingly high.



THIS ETNA performs three operations on an army cot leg . . . knurling design, tapering and sizing both ends. Production . . . 50 lots per hour

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

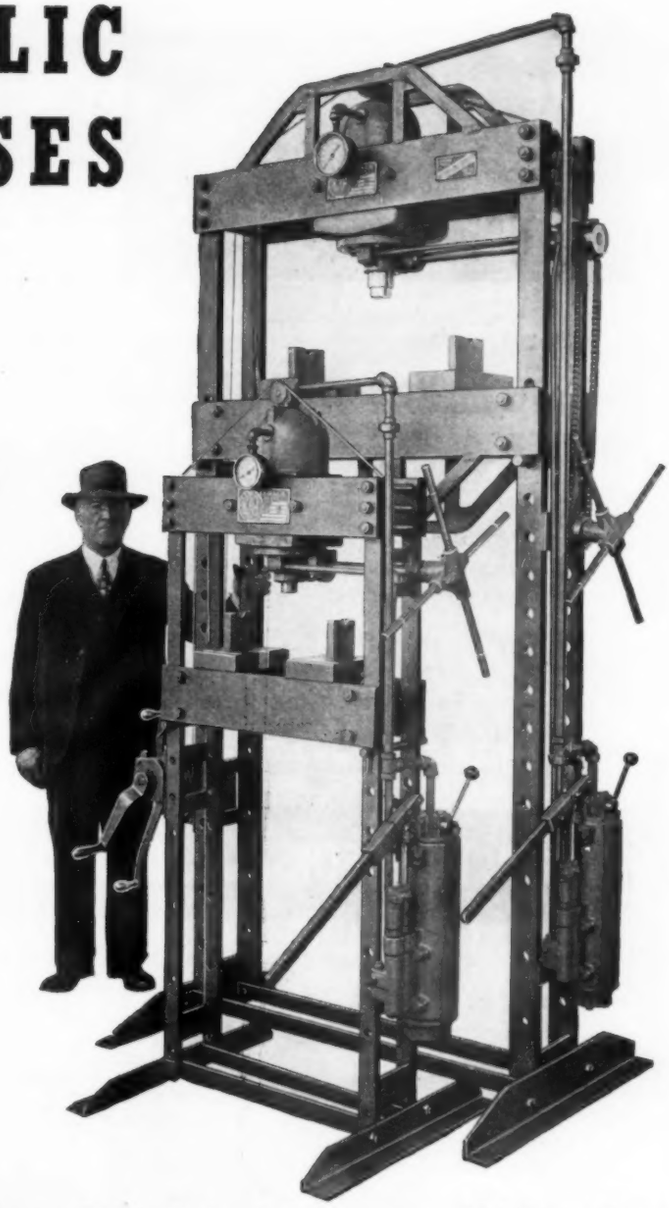
THE ETNA MACHINE COMPANY

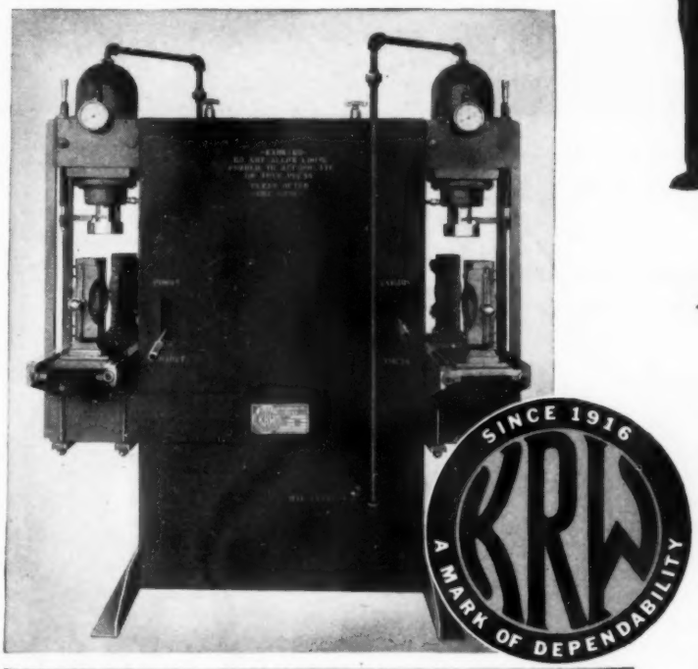
TOLEDO . . . OHIO

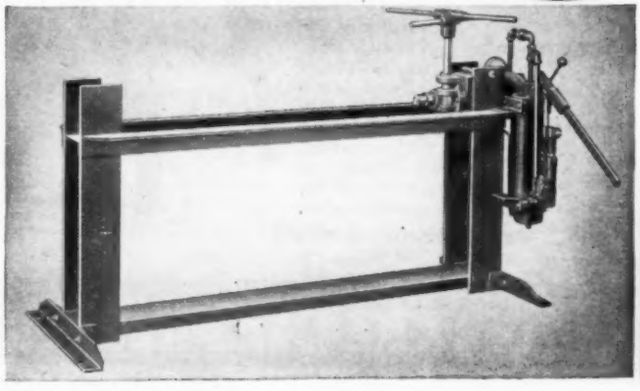
KRW HYDRAULIC ARBOR PRESSES

for War Production

Standard Hydraulic Presses in 25, 50 and 75 ton capacities. Special Presses engineered for specific war production needs.







The exclusive design features which have given KRW Standard Presses their reputation for speed and efficiency are available to war production manufacturers who require presses of special design. The illustration above shows a *special*, extra high 75 ton KRW Press in comparison with the Standard 25 ton unit. Opposite illustration shows a special, 4-man operated, air-oil Press used for bomb loading. Press illustrated at lower left is a special horizontal design built to meet customer's requirements.

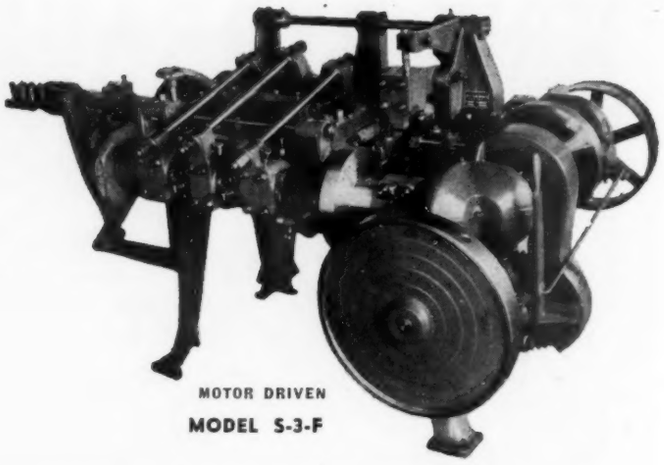
KRW also builds bench-type Arbor Presses in 1/2, 1 and 3 ton capacities.

K. R. WILSON
10 LOCK ST., BUFFALO, N. Y.

STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES



MOTOR DRIVEN
MODEL S-3-F

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

• •

We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO... *Bridgeport, Conn., U.S.A.*

DELIVERS FROM THE SAME PORT
Regardless of Direction of Shaft Rotation

ONLY TUTHILL AUTOMATIC REVERSING PUMPS GIVE YOU THIS PERFORMANCE

Without the use of check valves, Tuthill Automatic Reversing Pumps deliver from the same port regardless of direction of shaft rotation. This exclusive feature in these positive displacement, internal-gear rotary pumps solves the problem of driving a pump from a reversing shaft without changing the flow of the pumpage. It also provides the answer where the ultimate direction of shaft rotation is not known. Sizes from 1 to 50 g.p.m. and pressure to 100 p.s.i. Available with or without relieving feature. Also in stripped model form.

Write for Tuthill Automatic Reversing Pump bulletin

Tuthill PUMP COMPANY
939 EAST 95TH STREET • *Chicago*

PUT YOUR FOOT DOWN ON COSTS

Learn how Famco Foot Presses can cut corners on production and assembly . . . reduce time and labor in your plant. Sturdily built of semi-steel, they are accurately machined with close stroke adjustment. Stand-mounted or bench types. Write for complete details today.

FAMCO MACHINE COMPANY
1316—18th Street, Racine, Wis.

The No. 15 illustrates typical construction detail of all Famco Stand Mounted Foot Presses.

famco FOOT AND ARBOR PRESSES

CONTRACT WORK

Advertisements on this and the following page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

Our Grey Iron Foundry, Structural and Machine Shops are at your disposal

for

Medium Heavy

SPECIAL MACHINERY

CONTRACT WORK SOLICITED

ROBT. HOLMES & BROS., INC.

JUNCTION AVE. DANVILLE, ILL

FOR YOUR IMMEDIATE USE

5,000 MAN HRS. PER WEEK OF TOOL, DIE AND SPECIAL MACHINE DESIGNING

Est. 1930

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PRODUCT ENGINEERING SERVICE

2485 BEAUFAIT AVE. DETROIT, MICHIGAN

KIRK & BLUM

CONTRACT MANUFACTURING

ACCURATE SHEET STEEL STAINLESS STEEL, MONEL OR OTHER ALLOY FABRICATION OUR SPECIALTY

CAPACITY 3/8" AND LIGHTER

THE KIRK & BLUM MFG. CO.

2823 SPRING GROVE AVE. CINCINNATI, OHIO

GAGES—PUNCHES—DIES—ETC.

HEAT TREATING FACILITIES

BARTON MACHINE & TOOL CO.

PRECISION TOOL MAKERS

14 Taft Street Pawtucket, R. I.

Designers and Builders of Jigs, Fixtures and Small Tools.

Also Manufacturers of Automatic Turret Head for 10 inch Lathes.

Complete Details upon Request

GAS MODEL RESEARCH CO.

21 Market St. Rockville, Conn.

MACHINISTS AND ENGINEERS

FIDELITY MACHINE COMPANY

3908-18 Frankford Ave. Phila., Pa.

Jefferson 7600-1-2

STEEL FORGINGS

On Trip Hammers and Forging Rolls. Also all kinds of light, medium, and heavy hand forgings. Machining. Heat Treating.

Vince Forging & Manufacturing Co., Inc.

518 East 20th Street New York City

DESIGNERS OF

Jigs, Fixtures & Dies

Prompt Service

LAWRENCE W. SECREST CO.

P. O. Box 265

Alexandria Virginia

DESIGN & BUILD

JIGS, FIXTURES & GAGES

REED MACHINE & TOOL ENG.

BOX 662

PAWTUCKET, R. I.

SUB-CONTRACT FACILITIES FOR

Hand screw machine products.

Engine and bench lathe, milling and drill press work.

Small sheet metal fabrications to closer than commercial tolerances.

Stampings.

We do our own tooling.

RELIANCE MACHINE & MFG. CO.

Thirty Irving Place New York City

36 years experience in metal fabrication.

METAL STAMPINGS

• TOOLS • DIES •

PERMANENT MAGNETS

HEAT TREATING

THOMAS & SKINNER STEEL PRODUCTS CO.

1103 E. 23rd St. INDIANAPOLIS, IND

ADVERTISE HERE

for

PROFITABLE SUB-CONTRACTS

For details, write

CONTRACT WORK DEPT.

American Machinist, 330 W. 42nd St., N.Y.C.

CONTRACT WORK

Advertisements on this and the preceding page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

• Machines and Parts, • Special Tools and Fixtures, • Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE CO., BRIDGEPORT, CONN.

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.

KING FOUNDRIES, INC.

Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small

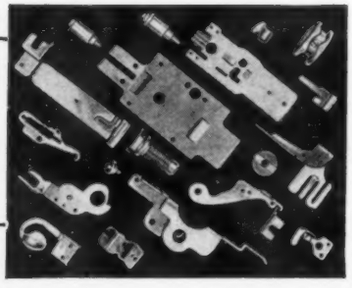
MATCH PLATE WORK A SPECIALTY

Put your pattern problems up to us—we will take care of them—ask the foundries about our work—they use our patterns every day.

GENERAL PATTERN WORKS

2233 Buck Street Cincinnati, Ohio

STAMPINGS AND ASSEMBLIES IN ALL KINDS OF METALS



Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.

We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.

Quality work by skilled mechanics is assured. Send your blueprints or samples today!

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.

546 BLAKE ST. NEW HAVEN, CONN.

FORGINGS

• All types up to 6,000 lbs. Smooth Forged—Finished—Rough Turned, Hollow Bored and Heat Treated to Specifications. Crank Shafts—Shafting—Connecting Rods

BAY CITY FORGE CO.

ERIE PENNSYLVANIA

WORK WANTED FOR

Cylindrical Grinder 10"x54", Horizontal Boring Mill 2½" bar, Lathes, Milling Machines, Shapers, Drill Presses, Hand Screw Machines, Foot and Power Presses, Bench.

HAIDA ENGINEERING CO.

34-11 Vernon Blvd. Long Island City, N. Y.

THE NORLIPP COMPANY

Engineers . . . Manufacturers

Sub-contract facilities for die castings and metal stampings

556 West Congress Street Chicago, Illinois

If you need

SCREW MACHINE PRODUCTS

write American Machinist's Contract Work Department for names of established manufacturers. If you make screw-machine products, you will find an advertisement on this page a profitable investment. Write today for complete details.

MACHINE SHOP WANTS DEFENSE WORK

Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

STEPHEN J. LEWIS ENGINEERING CO.

215 Butler St. Triangle 5-5348 Brooklyn, N. Y.

BRAZING HYDROGEN ELECTRIC FURNACE PROCESS

MODERN CONTINUOUS HIGH PRODUCTION EQUIPMENT

ALSO—BRIGHT ANNEALING

THE QUEEN CITY STEEL TREATING CO.

CINCINNATI, OHIO

MACHINE SHOP

Facilities include 9" South Bend Bench Lathe, ±2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmenship assure your satisfaction. Your inquiries invited.

C. VANDEGRIFT CO.

HOCKESSIN DELAWARE

COMMERCIAL HEAT TREATING

Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories
Cadmium & Hard Chrome Plating

AGERSTRAND CORPORATION

Muskegon, Michigan

WIRE AND METAL SPECIALTIES

In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing.

EASTERN TOOL & MFG. CO.

BLOOMFIELD, N. J.

We need sources for machining castings and outside screw machine capacity.
—A New York Concern

I want sources for instruments and parts.
—Chief Engineer, Washington Bureau

These are only two of the many inquiries received by our Contract Work Department from readers who could not find what they wanted advertised in the Section. This typifies the opportunities opened to you through advertising in these pages.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.
(See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time salaried employment only), ½ above rates.
PROPOSALS. 50 cents a line an insertion.

INFORMATION.

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns — 30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., November 16th will appear in the issue of November 26th subject to limitations of space available

OPPORTUNITY NOW AND AFTER WAR

ENGINEER EXPERIENCED IN MACHINE TOOL DESIGN and with special production layouts. Capable of originating designs; also of field engineering with sales force.

Practical experience operating machine tools desirable. For established company with headquarters in Chicago for position handling war machinery problems and qualified for opportunity developing new and special products after war. Compensation in accordance with capability and opportunity for advancement. Replies must be complete and will be kept confidential.

P-347, American Machinist
520 N. Michigan Ave., Chicago, Ill.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

PROJECT ENGINEER—To fill position covering engineering contacts, experimental development work, and miscellaneous mechanical and electrical accessories in the aircraft field. Engineering school and practical experience background. Must have draft deferment and not presently employed in war industry. Titeflex Metal Hose Co., 500 Frelinghuysen Avenue, Newark, N. J.

WANTED—DESIGNER for small cutting tools and for jigs, and fixtures. Permanent position. McQuay-Norris Manufacturing Co., Connersville, Indiana.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. This advertising service of 32 years recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

Manufacturing Executives and Technical Men, chemists and metallurgists immediate openings throughout country. Salaries $2500 to $20,000 year. Write for application. Confidential. Established 27 years. Harrison Personnel Service, 20 W. Jackson, Chicago.

EMPLOYMENT AGENCY

ENGINEERS—Fine selection of positions open for Manufacturing executives, Production Managers, Superintendents, Foremen, Metallurgists, Chemists, Instrument men, Technical men of all types. The Engineering Agency, Inc., Our 50th year, 53 W. Jackson Blvd., Chicago.

WHEN *Answering Advertisements*

PLEASE *do not send original letters, certificates or photographs. We cannot be responsible for their return. Please send photostat or carbon copies.*

GENERAL OR WORKS MANAGER

Draft deferred, twenty-three years practical experience handling new and directing work. Keenly alert to costs, methods and machine operations. Mechanical Engineer. Will go most anywhere. Starting salary dependent upon location.

PW-344, American Machinist
330 West 42nd St., New York, N. Y.

POSITIONS WANTED

POSITION WANTED—As Shop Superintendent, Production Manager, Chief Inspector. Experienced as Machinist, Supervisor, Supervising Inspector, Draftsman and Designer. Introduced new methods to speed up production, responsible for Ordnance Inspection valued in thousands. Proven initiative, leadership, sound judgment. Trained in Engineering, Metallurgy, Business Organization, Executive Control. Results promised. Age 36, deferred. PW-384, American Machinist, 330 W. 42nd St., New York, N. Y.

FIRST CLASS all around machinist, supervisory experience, wants job with company offering opportunity for advancement. Only steady job now and after the war considered. Employed at present, but not on defense work. Age 40—3A. PW-349, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITIES OFFERED

SALESMAN to sell new improved machine tools on commission basis, also jobbers, Tietzmann Engineering Co., 1043 Highland Ave., Dayton, Ohio.

TOOL SPECIALTY SALESMEN WANTED

Our Product bears AA and AAA rating, priced from $50.00 to $100.00 each and is used extensively for Maintenance and Building of Ships, Tanks, Airplanes, Trucks, Motors, by Railroads etc. In reply, tell us the territory you cover, for how long, the products you now sell and some leaders you contact.

Girard Manufacturing Products, Inc.
Wood, Illinois

A leading machine tool distributor now handling a number of lines in New England is interested in a turret lathe on an exclusive basis. Est. since 1905. Located in the heart of the manufacturing district.

Write to

RA-345 American Machinist
330 West 42nd Street, New York City

OPPORTUNITIES OFFERED

SALESMEN WANTED throughout country calling on tool-room and grinder foremen to carry a side line of greatly improved diamond point wheel dressers and diamond tools. Please write SW-343, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

FOR SALE

ONE WEBSTER WITCOMB (Hand) Watchmakers Lathe, Tale Stock, Hand Rest, Motor, Countershaft, 20 Chucks, $100.00. Also 10 lbs. Mercury $10.00. Dudley F. Fasoldt, Rensselaer, N. Y.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on page Facing inside back cover.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED

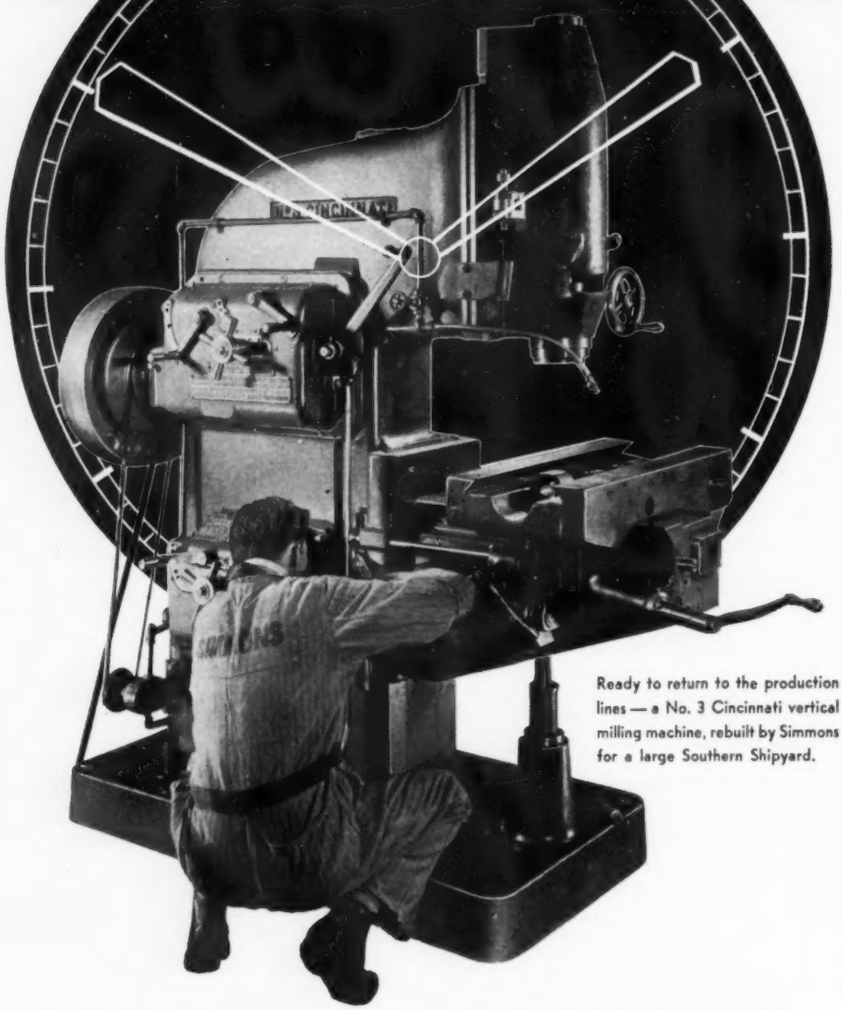
To purchase a business as a going concern with a suitably equipped factory of around 40 to 60 thousand square feet manufacturing area for the manufacture of high precision machine tools. Well equipped plant manufacturing light machine tools or machine equipment desired, but manufacturers of light printing machinery, hosiery or knitting machinery, light packaging machinery or similar products would be considered.

Please give full particulars of type of business, equipment available, and price, to

BO-346, American Machinist
520 N. Michigan Ave., Chicago, Ill.

FOUND

UNUSED HOURS



Ready to return to the production lines — a No. 3 Cincinnati vertical milling machine, rebuilt by Simmons for a large Southern Shipyard.

Soldiers are not expected to remain in the thick of battle without let-up. They get furloughs and sick leaves. Machines, too, must retire temporarily.

"Behind the lines" for ailing machine tools is the Simmons rebuilding plant in Albany. Here mechanical disabilities are completely repaired. Here skilled craftsmen find unused working hours in used equipment . . . send them "back up front" good as new.

Write TODAY for the new book "THE SIMMONS WAY" of Rebuilding

IN STOCK

Every machine listed in this column is in our warehouse at press time.

●

No. 39 NATCO MULTIPLE SPINDLE DRILL, M.D. 24" rail, bored for 12 spindles. Table working surface 14" x 40". Drill spindles 1½", No. 2 Taper.

30" HENRY-WRIGHT RADIAL DRILL. Ball Bearing, equipped with rotary tables and box table. Sensitive spindles for 1" cap.

2" x 12" WHEEL, HEAVY GRINDER with 230 volt D.C. 1550 RPM Motor BRIDGEPORT No. 1-DC.

30" x 30" x 10" NEWTON SLAB MILLER, Horizontal arbor, table working surface 27" x 10', M.D.

10-Ton HENRY-WRIGHT DIEING MACHINE with roll feed.

400-Ton NILES WHEEL PRESS, Double Type, 48" between bars, equipped with pump and motor.

60" THROAT LONG-ALSTATTER SINGLE END SHEAR, with 20" shear blades, approximate weight 42,000 lbs.

72" LONG-ALSTATTER MULTIPLE PUNCH, 6" throat, 1½" stroke, M.D.

6" x 6" x ⅝" SOUTHWARK DOUBLE ANGLE SHEAR, square or bevel, right or left hand, M.D.

HEADER, AJAX, 1½".

60" NEWTON PORTABLE SLOTTER.

DIEING PRESS, HENRY-WRIGHT, 10-ton.

PUNCH, H&J, 20" Throat, ¾" x ⅜" cap.

PUNCH, H&J, 42" Throat, 1" x ⅞" cap.

PUNCH, L&A, Double End, 24" Throat, ¾" x ¾".

●

SIMMONS ENGINEERED Machine Tool REBUILDING

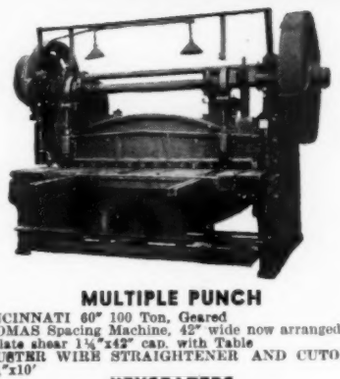
SIMMONS MACHINE TOOL CORPORATION

***Main Office and Plant:* 1759 N. BROADWAY, ALBANY, N. Y.**

***New York Office:* 149 BROADWAY**

When You Need Machine Tools Check "FALK'S" Stock

"FALK" for DEPENDABILITY in Rebuilt Machinery



MULTIPLE PUNCH

CINCINNATI 60" 100 Ton, Geared
THOMAS Spacing Machine, 42" wide now arranged for Plate shear 1¼"x42" cap. with Table
SHUSTER WIRE STRAIGHTENER AND CUTOFF. ¼"x10'

KEYSEATERS

#3½ BAKER—72"x3"
#1 LaPointe horiz. Broach
#4 LaPointe horiz. Broach
12" New Haven Slotter, Rotary Table

TURRET LATHES

Gisholt 21" x 3¾" Hole Universal Turret Lathe (2)
Gisholt 24" x 5" Hole Universal Turret Lathe (1)
Milholland Geared Head Hand Screw Machine 1⅝" cap. Arranged motor drive, now equipped as Milholland Lassiter Staybolt Machine.

AUTOMATICS

1¼ GRIDLEY Model "F" 4 spdle.
9/16 GRIDLEY Model "G" 4 spdle; (2)
#24 Prentice New Britain auto. Chucker
#23 Prentice New Britain auto. Chucker
12"x6" Jones & Lamson "Hartness" Chucker

PIPE MACHINES

18" SAUNDERS, M.D.
12" MERRILL, M.D.
6" WILLIAMS, M.D.
4" CURTIS Portable, M.D.
2" LANDIS, belt
2" JARECKI, belt

LATHES

36"x24' Pond Triple Geared Internal Geared Face Plate Screw Cutting Engine Lathe
36"x18' PRENTISS
34 x 12' Putnam
27"x16' New Haven Heavy
24"x12' PUTNAM, QCG
24"x14' REED-PRENTICE Geared Hd.
22"x16' REED light pattern, cone
19"x8' LeBlond Hvy. Duty, Pl. Turning
18" x 12' Hamilton Plain Change Lathe
18 x 10 Reed Plain Change Lathe
18"x10' Rahn-Larmon
18"x6' South Bend
16"x6' South Bend
14"x6' Monarch Geared Hd. Arranged M.D.
14 x 6 Hendey Yoke Head Arranged Motor Drive
14 x 6 Monarch
14 x 5 Hendey Yoke Head Cone Drive
12"x5' Champion, Pl. cone
10"x4' Davis Pl. Chnge
10 x 4' Logan (New) Lathes ball bearing spindle power cross feed, $225 f.o.b. factory, priority certificate required, prompt shipment.

DIE CASTING MACHINES

MADISON-KIPP #5—10x12 & 12x14 late

LOSWING LATHE

8"x108" Heavy Duty, Geared Head
4"x104" old model, Geared Head
4"x60" old model, Geared Head
4"x48" old model, Geared Head

GRINDERS

12x36 Cincinnati Plain Arranged Motor Drive
No. 51 Oliver Drill Grinder 3" Cap. Motor in Base
No. 6 Besley Double Opposed Disc Grinder
No. 23 Brown & Sharpe Internal Cylinder Grinder
No. 1 Brown & Sharpe Universal Cylindrical Grinder
No. 1 LeBlond Universal Tool and Cutter Grinder
No. 2 Brown & Sharpe Cutter Grinder
Taft-Pierce Automatic Pin Grinder
Gardner No. 4 Disc Grinder Double End, 20" disc, 16" ring wheel, ball bearing belt drive.
Berger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle, Universal table.
GARDNER #14 double opposed Disc
BESLEY #6 double opposed Disc
GORTON 24" DISC and Ring Wheel
GARDNER #4 DISC 23", Ring Wheel 16" Universal Tables, belt dr.
SPRINGFIELD FACE GRINDER, 12" CUP WHEEL.
ROGERS 60" KNIFE GRINDER
FLOOR GRINDERS, B-LINE (NEW) 12x2 Wheels; 2 horse power, Ball Bearing; fully enclosed, adj. Wheel Guards, exhaust Takeoff, electric lights; Tool supports; in-built switch. $175 any voltage.

THREADING MACHINES

Landis 1½" Double Head
Acme 1" Double Head
Chicago Automatic two spindle Vertical Threading Machine—14
Acme 2½" Single Head Threading Machine .
Landis 1½" Single Head Bolt Threading Machine
Landis 2½" Pipe Threading Machine.
National 2" Double Head Geared Motor Drive Threading Machine
Williams 6" Pipe Threading Machine.
Merrill 10" Pipe Threading Machine, Motor Drive with motor.
Curtis Portable 4" Pipe Threading Machine.
Williams 2" Pipe Threading Machine
Jarecki 2" Pipe Threading Machine.

COMPRESSORS—AIR

12"x10" INGERSOLL-RAND ERI with A.C. 50 H.P. Slip Ring Motor, etc.
10"x8" LAIDLAW, arr. Chain Motor Dr.
10x8x4 AMERICAN tandem Cyl. intercooler
8"x8" SULLIVAN Horiz. Belt dr.
6"x8" BURY Horiz. Belt Dr.
9"x8" BLAISDELL, horiz. belt dr.
4½x4½ CURTISS VERTICAL belt
6"x6" CURTISS TWIN CYL. VERTICAL

BUFFERS OR POLISHING LATHES

HAMMOND like new 10 HP type 10 PP 3-60-220/440 —8 months old

RADIAL DRILLS

3' Arm AMERICAN, Geared Box, SPD.
5' Arm Niles, flat col. Motor dr.
5' Arm Niles, flat col. Motor dr.

GEAR MACHINERY

GLEASON GEAR TESTER
WHITON #2 SPUR GEAR CUTTER, 36" cap.
BARBER-COLMAN #12 HOBBER
GOULD & EBERHART 36" Victoria Model
GOULD & EBERHART #36B, Spur and Bevel
ADAMS #1 Gear HOBBER
Van Norman Pinion Cutter, Small
Van Norman Pinion Cutter 3" cap.

AUTOMOTIVE CHUCKING MACHINE

2—No. 24 New Britain type 4 spindle, 5 chucking stations.
1—No. 23 New Britain type 4 spindle, 5 chucking
1—Jones & Lamson Hartness Automatic Chucking Lathe

DRILLS

SIPP-FOOTE-BURT 4 Spindle, power feed and quick return
Sipp—2 spindle #2 M.T.
AVEY 3 Spindle #2 M.T.
Avey 2 Spindle #3 M.T.
Leland-Gifford 2 spindle #2, 10" Overhang
ALLEN 3 spindle #2 M.T., Motorized
AVEY #3 single spindle Power feed, #3 M.T. 24"
AVEYMATIC single spindle with power feed; 20"
100 Spindles of High Speed sensitive, Ball Bearing Drill Presses made by Avey, Leland Gifford, Allen; Foote-Burt, Henry & Wright, Fosdick
New "BUFFALO" DRILLS—all sizes, many in stock

THREAD MILLERS

Hall Planatary No. 2—24" Swing
Lees Bradner No. 8—12" x 54
Pratt & Whitney 6 x 14

THREAD ROLLERS

Waterbury-Farrell No. 30 (2) ⅜" cap.
Waterbury-Farrell No. 10 with automatic hopper feed (2) ½" cap.
Waterbury-Farrell No. 0 (2) 5/32" cap.
158 Waterbury-Farrell Eight Plunger Eyelet Presses (2)
Waterbury-Farrel Shell Trimmers with hopper feed (2)

SHAPERS

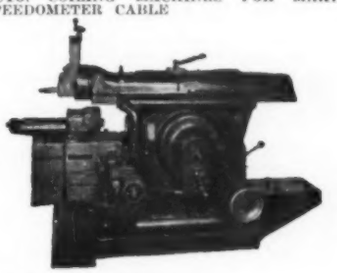
15" HENDEY Friction Dr.,
30" STEPTOE, Back Geared, cone
30"x20"x24" PLANER-SHAPER; NBP
16" Cincinnati Back Geared Crank Shaper
16" Gould & Eberhardt Back Geared Crank Shaper
12" New Haven Slotter 32" Rotary Table
6" Niles-Bement Slotter 18" Rotary Table, Cone Driven Like New

PRESSES

No. 5 Bliss Toggle Press (1)
No. 4 Bliss Toggle Presses (2)
#93F TOLEDO Dble Cr. Geared
#WFF Dble Cr. S.S. Geared, 70 ton
4" stroke; bed 30x26; 13" die space
#25N, #15N BLISS back flywheel
#2 Bliss Stiles type (10) also #1
#18—18C—#19—#19C—#20—BLISS, OBI
#25 NIAGARA ARCH; #30 Bliss Arch
#16 NIAGARA HORN, Geared, Motor Dr. with Table, elev. and swing, 5" sl.
#44 V & O HORN, Geared; Table 24x24 2½" Str. Motor dr.
WICKES Dble End PUNCH & SHEAR; 48" thro. cap. 1¼ thru 1½
SOUTHWARK 520 Ton Hydraulic Press; with Lourie Pump, bed 30"x144"

MILLERS

INDEX UNIVERSAL VERTICAL (new)
CLEVELAND #1— cap 2" End mill (new)
BECKER #7 LINCOLN TYPE
MISC. CHICAGO AUTOMATIC THREADERS, BAKER AUTO. DRILLS; SLEEPER & HARTLEY AUTO. COILING MACHINES FOR MAKING SPEEDOMETER CABLE



We try to maintain one of the leading stocks of Used Machinery.

SEND US YOUR INQUIRIES—EVERY ITEM FULLY GUARANTEED.

FALK MACHINERY COMPANY

MACHINERY MERCHANTS

18 WARD ST., ROCHESTER, N.Y.

AUTOMATICS

14"x19" Fay
No. 6A Potter & Johnston
Nos. 33, 34 and 454 New Britain
4½" Gridley model H
6"x6¾" Goss & DeLeeuw
1" Cleveland "J" double end
No. 16 Gisholt simplimatics
10" Bullard "Vert-au-Matic"

BROACHES

Nos. 1, 3 and 4 LaPoint screw
No. 3 LaPoint double screw
No. 2 Standard screw press
2 ton American rack vertical

DRILLS

15", 20", 21" Buffalo
20", 22½" and 26" Barnes
21" and 25" Superior
20", No. 210 Barnes heavy
24" Barnes all geared
20" No. 23 Foote Burt
21" Cincinnati manufacturing
Natco multiple Nos. 11, 12, B12, C12, 14 and 32, 8 to 62 spindles
No. 1 Baush multiple
No. 13 Pratt & Whitney multiple
Nos. 15½D and 15½F Foote Burt manufacturing
No. 8H Natco hydraulic horizontal multiple
Barnes vert. mult. hydr.
8 spindle No. 6 Moline Holehog
Nos. 0 and 00 Garvin duplex
4"x10" Sundstrand centerer
4' Hammond radial
Sensitive drills. Almost all makes and sizes

FORGING & STRUCTURAL

1½" Acme upsetters
2½" and 4" Ajax upsetters
2" National upsetter
No. 1A Ajax forging rolls
No. 4 Torrington swager
No. 6HS Langelier swager
60 lb. Bradley helve hammer
150 lb. Nazel air hammer
No. 1 Rock River bulldozer
No. 29 Williams White bulldozer
12", 1½"x1" Cleveland horizontal punch
12", 1¼"x1" Long & Alstatter punch
26", ¾"x¾" Rock River punch

GEAR MACHINERY

Nos. 3 & 12 Barber Colman
No. 18 H Gould & Eberhardt
Nos. 1 & 5A Lees Bradner
26"x48" Brown & Sharpe automatic
30" Flather automatic
36" Gould & Eberhardt automatic
60" Cincinnati automatic
Nos. 6, 61 & 62 Fellows shapers
18" Gleason testers & lappers
15" Gleason spiral gear rougers
Gleason spiral pinion rougher
18" Gleason bevel generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

GRINDERS

10x36 x 10x50 Norton
12x36 Landis
12x36 Cincinnati
Capitol internal
Nos. 6 & 15A Bryant internal
12"x36" Diamond surface
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18", 24" & 53" Gardner disc
24", No. 84 Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll tub type
30" Ransom elect. snagging
16" Norton snagging
2¼" Wil. & Morman drill
Type 15 Norton lapper
No. 575 Hawes tub polisher
20" & 36 Wet Tool

LATHES, TURRET

28" Steinle, 8" hole
24" Steinle 6¼" hole
22" Steinle, 3-9/16" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones & Lamson
Double spindle Jones & Lamson
14"x6' Lodge & Shipley with turret
No. 2 Acme
No. 2 Southworth
No. 2 Warner & Swasey

LATHES, MFG.

11"x3' South Bend, OCG
13"x20" Seneca Falls "Short Cut"
13"x6' Automatic threading
20"x8'6" Wickes mfg.
Melling camshaft
Melling crankshaft
28"x9' centers Bridgeford axle
3½"36" Lo Swing

MILLS, BORING

3⅞" bar Beeman & Smith horiz.
4-15/16" bar Barrett cylinder boring
36" Niles vert. car wheel borer

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No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatic
No. 6 Whitney hand
12" Pratt & Whitney automatic
Model AB Becker vertical

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24"x24"x5' Gray
24"x24"x6' Woodward & Powell
20"x20"x6' New Haven
36" Morton draw cut shaper
12" Dill vert. shaper or slotter

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Nos. P2 & PA3 Ferracute
Nos. 14½ & 41A Toledo horning
Nos. 6 & 6½ Wat. Ferrel gap
No. 76 Toledo gap frame
No. 62 Bliss gap frame
No. 38½ Bliss straight side
No. 53 Toledo straight side
No. 8-7 Zeh & Hahnemann S.S.
No. 7 Rockford straight side
No. 4 Massillion straight side
No. 2 Standard screw type
28", No. 71 Swaine dbl. cr.
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750 ton Baldwin Southwark triple action hydraulic toggle, 142½" between uprights

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20 ton Allen pneumatic

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Natco lead screw, 1 & 2 way
1½" National 6 spindle nut

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1½" Geometric
2" Landis double
2" Landis pipe & Nipple
2" Rogaco pipe mach.

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1—No. 2 Cincinnati Tool Grinder, M.D.
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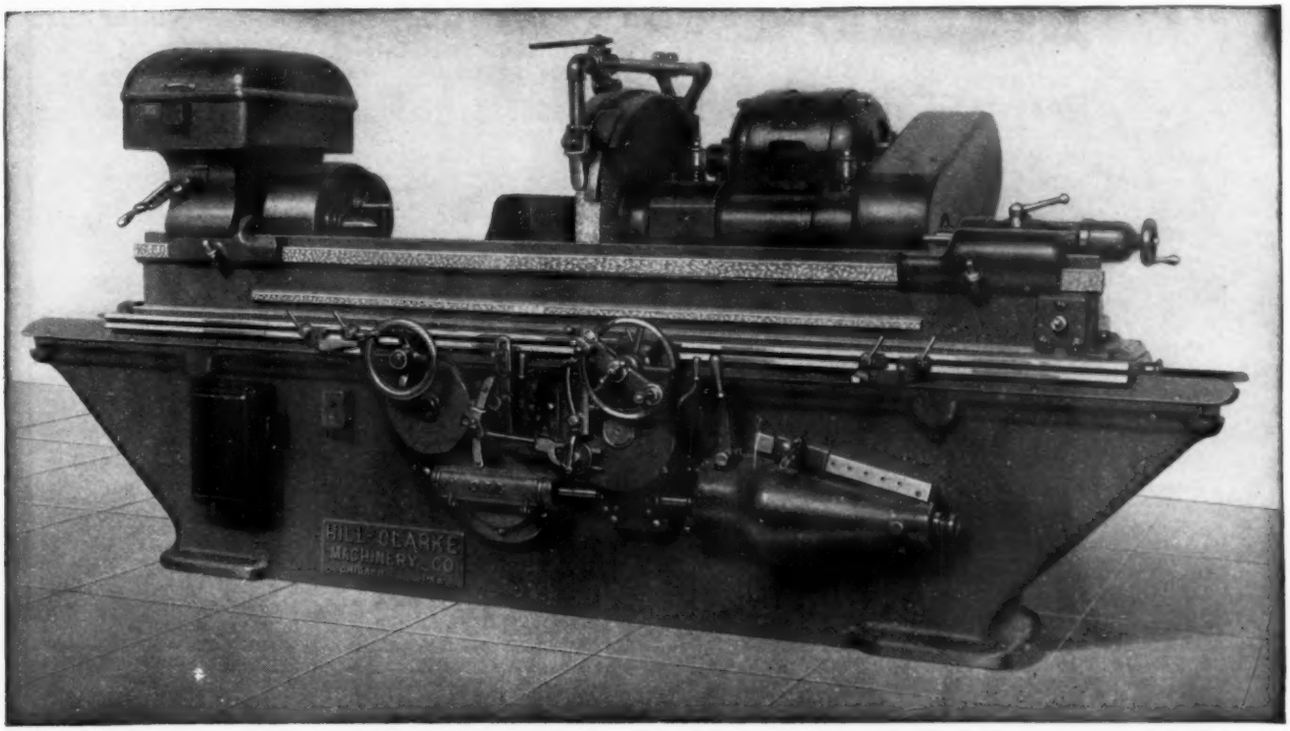

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20" x 14' Springfield, geared head, motor drive, quick change

20" x 8' LeBlond geared head, motor drive, quick change

18" x 14' Hamilton, belt drive, quick change

MISCELLANEOUS

2¾ x 3¾ Cleveland Model A automatic screw machine

5' Bickford Plain Radial Drill, gear box, motor drive

66" swing Betts, Vertical Boring Mill, 2 heads, belt drive

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25-ton Henry & Wright Dieing Machine, 5½" single roll feed

Henderson geared Forming Press, bed 20x50, 40-ton capacity

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200-ton Caldwell Wheel Press, 38" between the bars, motor drive

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24x24x8 Whitcomb Planer
36"x36"x8' Woodward & Powell Planer Rev. M.D.
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2" Acme Bolt Threader

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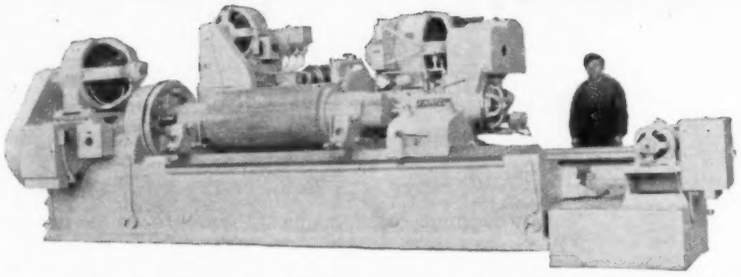

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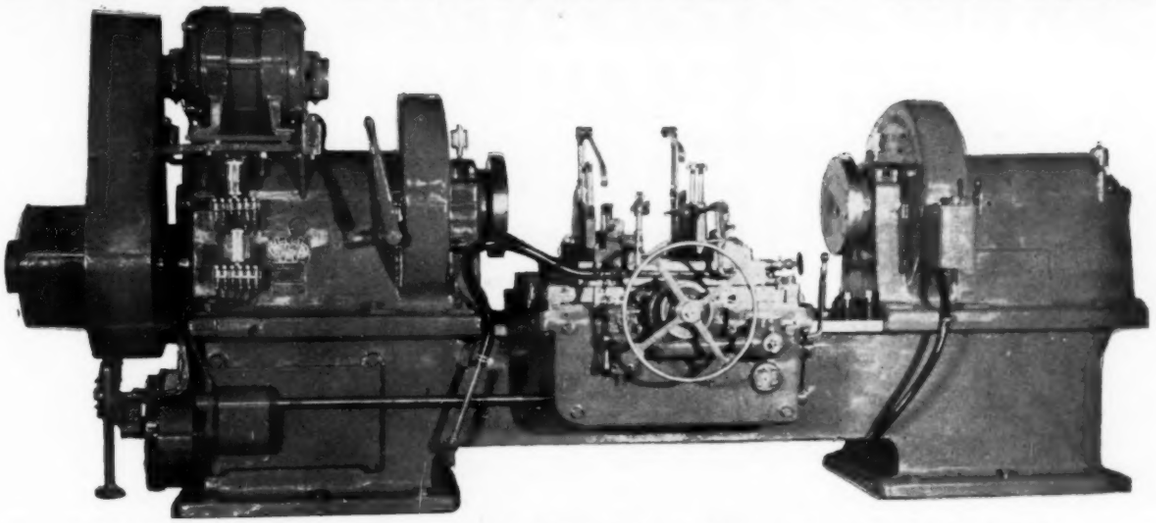

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Feedex table for automatic feedex drill
Hancock Flame Cutting
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1⅛" Landis two spdl. threader
#1 LaPointe Broach
3' Radial Drill
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Williams Pipe threader 6"
Torrington Swedger
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Cross gear tooth rounder
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16" x 10' Monarch Cone Drive, Q.C.
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40" x 20' McCabe Lathe, Cone Drive, Trip. Grd.
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6" Bilgram Bevel Gear Generator.
#00 Pfauter Gear Hobber.
#1 Adams Gear Hobber.
#1 Schucahrdt & Schutte Gear Hobbers.
Lees Bradner Gear Grinder.

MILLS
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32" x 32" x 18' Gray Planer, 2 Heads.
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No. 20 Bryant Internal
No. 50, 55, 60, 65 Heald Cylinder
No. 20 Gardner Combination Disc and Roll Sander, 2 motor drive
Cincinnati Valve Seat Grinder, m.d.
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Gisholt Universal Tool, belt
Gleason Cutter Grinder, belt
Gould & Eberhardt Gear Cutter Grinder, belt
Yankee Twist Drill Grinder, 1¼" cap.
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12x36" Cincinnati
12x36" Modern, belt
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6" Columbus, belt
8" Bignall & Keeler, belt
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36" Fellows
G.E. 3" x 36" Spur
G.E. 36"

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5—#55 National Acme, M.D.
2¼" Gridley Single Spindle
1—#53 National Acme
1—B & S 2G

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#1½ American Horizontal
#3 Garvin Duplex
3—18" Cincinnati Production
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Modern—16" x 60" M.D.

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4' Bickford
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40" Bickford Boring Mill—Single Turret Head on rail
36" Car Wheel Boring Mill

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2" Binsee

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GEAR CUTTERS
- No. 60 BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS
- (See page 241—special advertisement Hill-Clarke Cylindrical Grinders)
- No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating
- No. 10 Lees-Bradner Spur Gear Grinder
- 1½" dia. New Yankee Drill Grinder

LATHES
- No. 4 AC LeBlond Auto. Duplex Crankshaft

TAPPERS
- No. 4 Gaterman Tapper, 5/16" Capacity

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- ¾" Gridley Model F, four spindle
- No. 515 National Acme, four spindle
- 2⅛" Cleveland Model A, single spindle
- 2½" Cleveland Model A single spindle

BROACHES
- No. XB10 Oilgear Hydraulic Twin spindle
- 15 Ton Hercules Vertical

DRILLS
- 24" Superior, single spindle, compound table
- 24" Cincinnati, single spindle, tapping attachment
- No. 17 D Moline Hole Hog, six spindle, No. 5 M.T.
- 4' Prentice Radial
- No. 1½ Foote Burt, 2 spindle
- No. 15½ Foote Burt Fixed Center
- No. 37 Natco Multiple Spindle
- No. 1 Bausch, 8 spindle
- Pratt & Whitney Gun Barrel, 2 spindle, m.d.

GEAR CUTTERS
- No. 3 Brown & Sharpe Automatic
- No. 6 Fellows Gear Shaper
- 96" Gleason Gear Planer
- 15" Gleason Spiral Bevel Generator
- 18" Gleason Gear Tester
- No. 5A Lees-Bradner Gear Generator
- No. 10 Lees-Bradner Gear Grinder
- 30" Rochester Gear Tooth Rounder

GRINDERS
- No. 2 Webster & Perks Universal
- No. 2 Cincinnati Centerless
- 10"x20" Landis Cylindrical hydraulic
- No. 60 Heald Cylinder
- No. 24—53" Gardner Disc

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- 14"x8' Walcott, c.d.
- 16"x6' Cisco, q.h.
- 16"x6' LeBlonde, c.d.
- 17"x8' Sidney, c.d.
- 24"x12' Walcott Blaisdel, c.d.
- 24"x12'Walcott, c.d.
- 24"x14' Reed Prentice, q.h.
- 30"x15' American, q.h.

TURRET LATHES
- No. 3A Warner & Swasey, q.h.
- 24" Steinle, q.h., 6" hole
- No. 6A Potter & Johnston q.h.

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- No. 2A Brown & Sharpe Universal, s.p.d.
- No. 3 Ohio Plain
- No. 12 Brown & Sharpe Plain, c.d.
- No. 4 Cincinnati Vertical, s.p.d.
- No. 5C Becker, Vertical
- No. 7 Becker Lincoln Type
- 2½ Cleveland Horizontal Boring, s.p.d.
- 4" Bement-Niles Horizontal Boring
- 42" Niles Vertical Boring
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- 6"x48" Pratt & Whitney Thread Mill

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- 2" Pratt & Whitney Duplex Spline Mill
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- 54"x54"x16' Niles-Bement-Pond Planer, 4 heads
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- 9"x9" Peerless Universal Shaping, m.d.
- No. 12 Higley Cold Cut, 16" blade
- 48" Ryerson Friction, m.d.

TAPPERS
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GRINDERS, Norton, 10 & 14x36" Plain
LATHE, Putnam, 60"x17' with 12" Riser Blocks
MILLING MACHINES, Craftsman #1, 2 & 3
PLANERS, Bedford & Patch, 36"x13' Open Side with 1 Rail & 1 Side Head
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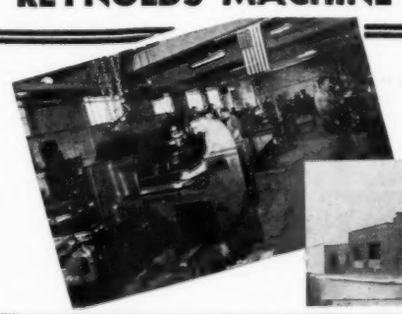

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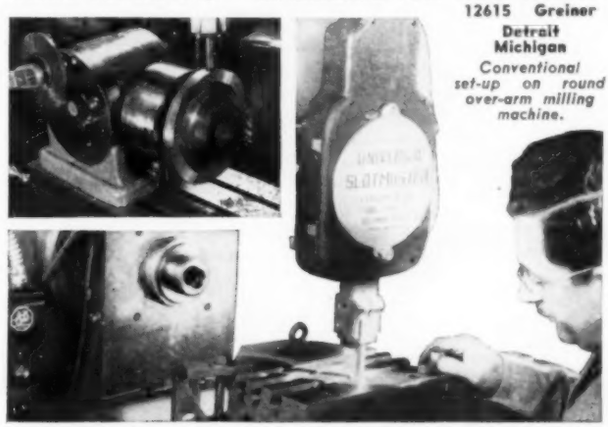

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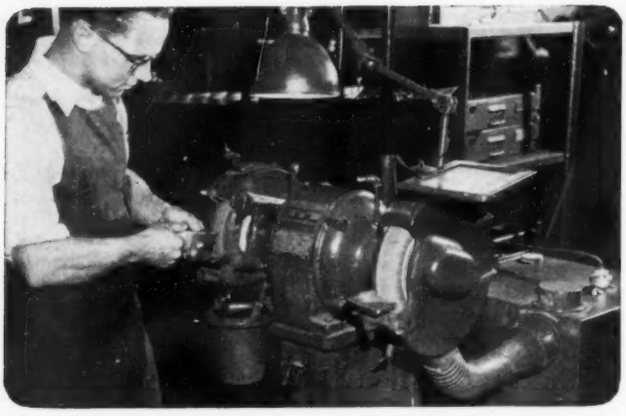

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Torrington Co., Torrington, Conn.

BEARINGS, Non-Metallic
Bakelite Corp., N. Y. C.

BEARINGS, Oilless & Graphite
Bunting Brass & Bronze Co., Toledo, O.
Carlyle Johnson Machine Co., Manchester, Conn.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Roller
Bantam Bearings Corp., So. Bend, Ind.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of Amer., Trenton, N. J.
S. K. F. Industries, Inc., Philadelphia
Timken Roller Bearing Co., Canton, O.

BEARINGS, Thrust
(See preceding classifications)

BELLOWS, Seamless Metal
Chicago Metal Hose Corp., Maywood, Ill

BELTING, Leather
Greene, Tweed & Co., N. Y. C.
Houghton & Co., E. F. Philadelphia

BELTING, Rubber & Fabric
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Col.

BELTS & BANDS, Abrasive
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y
Dumore Co., Racine, Wis.
Norton Company, Worcester, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Walls Sales Corp., N. Y. C.

BELTS "V"
Allis-Chalmers Mfg. Co., Milwaukee
Dayton Rubber Mfg. Co., Dayton O.
Dodge Mfg. Corp., Mishawaka, Ind.
Gates Rubber Co., Denver, Col.

BENCHES, Shop
Baumbach Mfg. Co., E. A., Chicago
Delta Mfg. Co., Milwaukee
Hardinge Brothers, Inc., Elmira, N. Y.
Hill Acme Co., Cleveland
New Britain-Gridley Machine Div., New Britain, Conn.
Rivett Lathe & Grinder, Inc., Boston
Standard Pressed Steel Co., Jenkintown, Pa.
Walker-Turner Co., Plainfield, N. J.

BENDERS, Hand
O'Neil-Irwin Mfg. Co., Minneapolis

BENDING & STRAIGHTENING Machines
Baldwin-Southwark Corp., Philadelphia
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Wks., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Elmes Engrg. Works, Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

BINS, Tool & Parts (See LOCKERS & SHELVING)

BITS, Tool
Allegheny-Ludlum Steel Corp., Pittsburgh
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Black Drill Co., Cleveland
Carboloy Co., Detroit
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Colonial Broach Co., Detroit
Crafts Co., Inc., Arthur A. Boston
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Latrobe Electric Steel Co., Latrobe, Pa.
McCrosky Tool Corp., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Union Twist Drill Co., Athol, Mass.
Vanadium Alloys Steel Co., Pittsburgh
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., Buffalo, N. Y.

BLADES, Circular-Saw (See SAW BLADES, Circular)

BLADES, Cutter, Milling, Boring & Reaming (See BITS, Tool)

BLADES, Hack- & Band-Saw
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C. Indianapolis
Capewell Mfg. Co., Hartford, Conn.
Clemson Bros., Inc., Middletown, N. Y.
Continental Machines, Inc., Minneapolis
Disston & Sons, Inc., Henry, Philadelphia
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Thompson & Sons Co., Henry G., New Haven, Conn.
Victor Saw Works, Middletown, N. Y.

BLOCKS, Pillow
Allis-Chalmers Mfg. Co., Milwaukee
Dodge Mfg. Corp., Mishawaka, Ind.
Earle Gear & Mach. Co., Philadelphia
Fafnir Bearing Co., New Britain, Conn.
Farrel-Birmingham Co., Ansonia, Conn.
Hill Acme Co., Cleveland
Norma-Hoffmann Bearnigs Corp., Stamford, Conn.
S. K. F. Industries, Inc., Philadelphia
Standard Pressed Steel Co., Jenkintown, Pa.

BLOCKS, Precision Gage
Atometric Precision Gage Laboratories, Inc., Stamford, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., Dearborn, Mich.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., Watertown, Mass.
Webber Gage Co., Cleveland

WHERE-TO-BUY DIRECTORY

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Brown & Sharpe Mfg. Co., Providence, R. I.
Graham Mfg. Co., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

BLOWERS
Allis-Chalmers Mfg. Co., Milwaukee
American Gas Furn. Co., Elizabeth, N. J.
Buffalo Forge Co., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Wagner Electric Corp., St. Louis

BLOWERS, Electric Hand
Buffalo Forge Co., Buffalo, N. Y.
Ideal Commutator Dresser Co., Chicago
Skilsaw, Inc., Chicago

BLUING, Layout
Dykem Co., St. Louis

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Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Consolidated Machine Tool Corp., Rochester, N. Y.
Eastern Machine Screw Corp., New Haven, Conn.
Federal Press Co., Elkhart, Ind.
Foote-Burt Co., Cleveland
Geometric Tool Co., New Haven, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haskins Co., R. G. Chicago
Hendey Machine Co., Torrington, Conn.
Hill Acme Co., Cleveland
Landis Machine Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
New Britain-Gridley Machine Div., New Britain, Conn.
Oster Mfg. Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Scherr Co., Geo., N. Y. C.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V. & O. Press Co, Hudson, N. Y.

BOLTS, Eye & T-Slot
American Chain & Cable Co., Bridgeport, Conn.
Armstrong Bros. Tool Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

BOLTS & NUTS
Bethlehem Steel Co., Bethlehem, Pa.
Elastic Stop Nut Corp., Union, N. J.
Parker-Kalon Corp., N. Y. C.
Republic Steel Corp., Cleveland
Rhode Island Tool Co., Providence, R. I.
Standard Pressed Steel Co., Jenkintown, Pa.

BORING, DRILLING & MILLING MACHINES, Horizontal
Atlantic Machinery Co., N. Y. C.
Avey Drilling Mach. Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bryant Machinery & Engrg Co., Chicago
Buhr Mach. Tool Co., Ann Arbor, Mich.
Cincinnati Gilbert Mach. Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Defiance Mach. Wks. Inc., Defiance, Ohio
DeVlieg Machine Co., Ferndale, Mich.
Foote-Burt Co., Cleveland
General Machy. Corp., Hamilton, O.
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Greenlee Bros. & Co., Rockford, Ill.
Lucas Machine Tool Co., Cleveland
Moline Tool Co., Moline, Ill.
National Acme Co., Cleveland
National Auto Tool Co., Richmond, Ind.
Ohio Machine Tool Co., Kenton, O.
Sheffield Corp., Dayton, O.
Sellers & Co., Inc., Wm., Philadelphia
Snyder Tool & Engrg. Co., Detroit
Springfield Mach. Tool Co., Springfield, O.
Universal Boring Mach. Co., Hudson, Mass.
Yoder Co., Cleveland

BORING MACHINES, Jig (See JIG-BORING MACHINES)

BORING MACHINES, Precision
Barnes Co., W. F. & John, Rockford, Ill.
Bryant Machinery & Engrg. Co., Chicago
Ex-Cell-O Corp., Detroit
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Heald Machine Co., Worchester, Mass.
Leland-Gifford Co., Worcester, Mass.
Lucas Machine Tool Co., Cleveland
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
Sheffield Corp., Dayton, O.
Stokerunit Corp., Milwaukee, Wis.
Universal Boring Mach. Co., Hudson, Mass.

BORING MILLS, Vertical
Baush Mach. Tool Co., Springfield, Mass.
Bullard Co., Bridgeport, Conn.
Cincinnati Planer-Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
King Machine Tool Co., Cincinnati
Sellers & Co., Inc., Wm. Philadelphia
Springfield Mach. Tool Co., Springfield, O.

BOXES, Tote
American Metal Works, Inc., Philadelphia, Pa.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

BRAKES, Bending, Power
Bryant Machinery & Engrg. Co., Chicago
Cincinnati Shaper Co., Cincinnati
Cleveland Crane & Engrg. Co., Wickliffe, O.
Cleveland Punch & Shear Wks. Co., Cleveland

BRAKES, Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

BRICK, Furnace (See REFRACTORIES)
BROACHES
American Broach & Machine Co., Ann Arbor, Mich.
Butterfield & Co., Derby Line, Vt.
Colonial Broach Co., Detroit
Dalzen Tool & Mfg. Co., Detroit
Detroit Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
East Shore Mach. Pdts. Co., Cleveland
Ex-Cell-O Corp., Detroit
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Lapointe Mach. Tool Co., Hudson, Mass
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
National Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

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Cincinnati Milling Mach. Co., Cincinnati
Colonial Broach Co., Detroit
Consolidated Machine Tool Corp., Rochester, N. Y.
Elmes Engrg Works, Chas. F., Chicago
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Lapointe Mach. Tool Co., Hudson, Mass
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
Thompson Grinder Co., Springfield, O.

BRONZE, Phosphor (See PHOSPHOR BRONZE)

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Delta Mfg. Co., Milwaukee
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Gardner Machine Co., Beloit, Wis.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Haskins Co., R. G., Chicago
Heald Machine Co., Worcester, Mass.
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Jefferson Mach. Tool Co., Cincinnati
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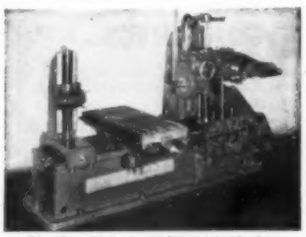

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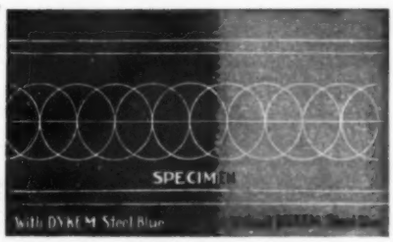

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Walker-Turner Co., Plainfield, N. J.

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Roberts Rubber Co., Weldon, Newark, N. J.

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Elmes Eng. Works, Chas. F., Chicago
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Watson-Stillman Co., Roselle, N. J.

BURNERS, Gas & Oil Furnace
American Gas Furn. Co., Elizabeth, N. J.
Hones, Inc., Charles A., Baldwin, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Surface Combustion Corp., Toledo, O.

BURNISHERS, Gear
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

BURNISHING MACHINES
Consolidated Machine Tool Corp., Rochester, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., Detroit
Sheffield Corp., Dayton, O.

BURRING MACHINES
Consolidated Mach. Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Hill Acme Co., Cleveland
National Broach & Machine Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

BUSHINGS, Drill
Carboloy Co., Detroit
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Metal Carbides Corp., Youngstown, O.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Steel (See LOCKERS & SHELVING)

CALIPERS & COMPASSES
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Farrel-Birmingham Co., Ansonia, Conn.
Lufkin Rule Co., Saginaw, Mich.
Randall & Stickney, Waltham, Mass.
Scherr Co., Geo., N. Y. C.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

CAMS, Machine
Brown & Sharpe Mfg. Co., Providence, R. I.
Cross Gear & Machine Co., Detroit
Hartford Special Machinery Co., Hartford, Conn.
Weldon Tool Co., Cleveland

CARBURIZERS (See also BOXES, Heat-Treating & Annealing)
American Gas Furn. Co., Elizabeth, N. J.
Houghton & Co., E. F., Philadelphia
Surface Combustion Corp., Toledo, O.

CARTRIDGE-CASE FINISHING MACHINES
Coulter Mach. Co., Jas., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

CASTINGS
American Brake Shoe & Fdry. Co., N. Y. C.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bunting Brass & Bronze Co., Toledo
Etna Machine Co., Toledo, O.
Hill Acme Co., Cleveland
Jefferson Mach. Tool Co., Cincinnati
Johnson Bronze Co., New Castle, Pa.
Mattison Machine Wks., Rockford, Ill.
Springfield Mach. Tool Co., Springfield, O.

CEMENT, Belt
Desmond-Stephan Mfg. Co., Urbana, O.
Houghton & Co., E. F., Philadelphia

CEMENT, Refractory
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

CENTERING MACHINES
Consolidated Mach. Tool Corp., Rochester, N. Y.
Hanson-Whitney Machine Co., Hartford, Conn.
Hendey Machine Co., Torrington, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Seneca Falls Mach. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Co., Rockford, Ill.

CENTERS, Bench
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., Dearborn, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Providence, R. I.

CENTERS, Machine
Abrasive Mach. Tool Co., E. Providence, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Company, Bridgeport, Conn.
Carboloy Co., Detroit
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Hendey Machine Co., Torrington, Conn.
Ideal Commutator Dresser Co., Chicago
Knight Machinery Co., W. B., St. Louis
McKenna Metals Co., Latrobe, Pa.
Metal Carbides Corp., Youngstown, O.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Stevens, Inc., John B., N. Y. C.
Sturdimatic Tool Co., Detroit
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.

CENTRIFUGALS (See PURIFIERS, Oil & Coolant)

CENTRIFUGAL MACHINERY
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.
Sparkler Mfg. Co., Mundelein, Ill.
Tolhurst Div., American Machine & Metals, Inc., East Moline, Ill.

CHAIN, Forged-Steel Link
American Chain & Cable Co., Bridgeport, Conn.
Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
McKay Co., Pittsburgh
Scully Steel Products Co., Chicago

CHAINS, Conveyor
Allis-Chalmers Mfg. Co., Milwaukee
American Chain & Cable Co., Bridgeport, Conn.

CHAINS, Transmission
Bilgram Gear & Mach. Wks., Philadelphia
Cincinnati Gear Co., Cincinnati
Morse Chain Co., Ithaca, N. Y.
Ohio Gear Co., Cleveland

CHAMFERING MACHINES
Bilgram Gear & Mach. Wks., Philadelphia
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Lipe-Rollway Corp., Syracuse, N. Y.
Murchey Machine & Tool Co., Detroit
National Broach & Mach. Co., Detroit
Sheffield Corp., Dayton, O.

CHECKS, Metal, Time and Tool
Acromark Co., Elizabeth, N. J.
Noble & Westbrook Mfg. Co., East Hartford, Conn.
Revere Copper & Brass Inc., N. Y. C.

CHISELS, Hand (See TOOLS, Hand)

CHISELS, Chipping, Pneumatic & Electric Hammer
Bethlehem Steel Co., Bethlehem, Pa.
Black & Decker Mfg. Co., Towson, Md.
Cleveland Pneumatic Tool Co., Cleveland
Plomb Tool Co., Los Angeles, Calif.
Scully-Jones & Co., Chicago

CHUCKING MACHINES (See also LATHES, Automatic & Semi-Automatic)
Bullard Co., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Foote-Burt Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Gorton Mach. Co., George, Racine, Wis.
Goss & deLeeuw Mach. Co., New Britain, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Lees-Bradner Co., Cleveland
National Acme Co., Cleveland
New Britain-Gridley Mach. Div., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland
Wickman Corp., Detroit

CHUCKS, Air (See CHUCKS, Pneumatic)

CHUCKS, Collet (See Collets)

CHUCKS, Drill & Tap
Atlas Press Co., Kalamazoo, Mich.
Errington Mech. Lab., Stapleton, N. Y.
Ettco Tool Co., Brooklyn, N. Y.
Gisholt Machine Co., Madison, Wis.
Horton & Son Co., E., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
McCrosky Tool Corp., Meadville, Pa.
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
North Bros. Mfg. Co., Philadelphia
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland

CHUCKS, Drill, Quick-Change, Collet
Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Modern Tool Works, Rochester, N. Y.
Scully-Jones & Co., Chicago

CHUCKS, Gear
Cushman Chuck Co., Hartford, Conn.
Gleason Works, Rochester, N. Y.
Sheffield Corp., Dayton, O.

CHUCKS, Hydraulic
Cross Gear & Machine Co., Detroit
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
New Britain-Gridley Machine Div., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Tomkins-Johnson Co., Jackson, Mich.
Warner & Swasey Co., Cleveland

CHUCKS, Lathe
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Cushman Chuck Co., Hartford, Conn.
Delta Mfg. Co., Milwaukee
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Harnischfeger Corp., Milwaukee
Hendey Machine Co., Torrington, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
L-W Chuck Co., Toledo, O.
McCrosky Tool Corp., Meadville, Pa.
Potter & Johnston Machine Co., Pawtucket, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scherr Co., Geo., N. Y. C.
Tomkins-Johnson Co., Jackson, Mich.

CHUCKS, Magnetic
Abrasive Mach. Tool Co., E. Providence, R. I.
Arter Grinding Mach. Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
L-W Chuck Co., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

CHUCKS, Motorized Electric
Cushman Chuck Co., Hartford, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland

CHUCKS, Pneumatic
Cushman Chuck Co., Hartford, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Tomkins-Johnson Co., Jackson, Mich.
Warner & Swasey Co., Cleveland

CHUCKS, Ring-Wheel
Abrasive Mach. Tool Co., E. Providence, R. I.
Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn.
Gardner Machine Co., Beloit, Wis.

CHUCKS, Spring
Brown & Sharpe Mfg. Co., Providence, R. I.
Harnischfeger Corp., Milwaukee
Rivett Lathe & Grinder, Inc., Boston

CLAMPS, Machinist's
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence R. I.
Lufkin Rule Co., Saginaw, Mich.
North Bros. Mfg. Co., Philadelphia
Williams & Co., J. H., Buffalo, N. Y.

CLEANERS, Industrial Vacuum
Ideal Commutator Dresser Co., Chicago

CLEANERS, Metal (See COMPOUNDS, Cleaning)

CLEANING EQUIPMENT (See METAL-CLEANING EQUIPMENT)

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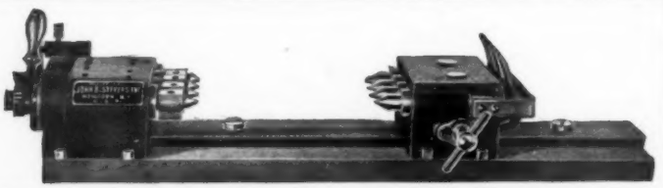

WHERE-TO-BUY DIRECTORY

CLOTH, Abrasive (See **PAPER & CLOTH, Abrasive**)

CLUTCHES, Friction
Allis-Chalmers Mfg. Co., Milwaukee
Carlyle Johnson Machine Co., Manchester, Conn.
Dodge Mfg. Corp., Mishawaka, Ind.
Errington Mech. Lab., Stapleton, N. Y.
Foote Bros. Gear & Machine Co., Chicago
Hill Acme Co., Cleveland, O.
Lipe-Rollway Corp., Syracuse, N. Y.
Morse Chain Co., Ithaca, N. Y.
Reeves Pulley Co., Indianapolis

COLLARS, Safety
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Dodge Mfg. Corp., Mishawaka, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLARS, Spacing
Atkins & Co., E. C., Indianapolis
Hill Acme Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford, Mass.
Scully-Jones & Co., Chicago
Standard Pressed Steel Co., Jenkintown, Pa.

COLLECTORS, Dust
Blake Co., Edward, Newton Centre, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Covel Mfg. Co., Benton Harbor, Mich.
Torit Mfg. Co., St. Paul, Minn.

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Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Cincinnati Milling Mach. Co., Cincinnati
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Hendley Machine Co., Torrington, Conn.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland
National Auto. Tool Co., Richmond, Ind.
National Twist Drill & Mach. Co., Detroit
New Britain-Gridley Machine Co., New Britain, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Stark Tool Co., Waltham, Mass.
Sundstrand Mach. Tool Co., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Van Norman Mach. Tool Co., Springfield, Mass.
Warner & Swasey Co., Cleveland

COMPARATORS, Dial
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.

COMPARATORS, Gear-Tooth & Screw-Thread
Farrel-Birmingham Co., Buffalo, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.

COMPARATORS, Optical
Jones & Lamson Mach. Co., Springfield, Vt.
Scherr Co., Inc., Geo., N. Y. C.
Vard, Inc., Pasadena, Calif.

COMPASSES, Metal-Scribing (See **CALIPERS & COMPASSES**)

COMPOUNDS, Cleaning
Bullard Co., Bridgeport, Conn.
Cabot Inc., Samuel, Boston
Detroit Rex Products Co., Detroit
Houghton & Co., E. F., Philadelphia
Magnus Chemical Co., Garwood, N. J.
Oakite Products, N. Y. C.
Turco Products, Inc., Los Angeles

COMPOUNDS, Drawing, Metal & Wire
Houghton & Co., E. F., Philadelphia
Shell Oil Co., Inc., N. Y. C.

COMPOUNDS, Grinding & Polishing
Carborundum Co., Niagara Falls, N. Y.
National Broach & Machine Co., Detroit
Norton Co., Worcester, Mass.

COMPOUNDS, Plastic Molding
Bakelite Corp., N. Y. C.
Dow Chemical Co., Midland, Mich.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

COMPOUNDS, Tempering & Case-Hardening
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Strong, Carlisle & Hammond Co., Cleveland
Stuart Oil Co., D. A., Chicago

COMPRESSORS, Air & Gas
Allis-Chalmers Mfg. Co., Milwaukee
American Gas Furn. Co., Elizabeth, N. J.
Curtis Pneumatic Machry. Co., St. Louis
General Electric Co., Schenectady, N. Y.
Wright Mfg. Div. of Amer. Chain & Cable Co., York, Pa.

CONSULTANTS
Trundle Engrg. Co., Cleveland

CONTOUR MACHINES
Continental Machines, Inc., Minneapolis
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

CONTRACT WORK (See also Index, last page)
Aluminum Co. of America, Pittsburgh
Baldwin Southwark Corp., Philadelphia
Bayard & Co., M. L., Philadelphia
Chapman-Valve Mfg. Co., Boston (Heat-Treating)
Continental Can Co., Inc., N. Y. C.
Eastern Machine Screw Corp., New Haven, Conn.
Elmes Engrg. Wks., Chas. F., Chicago
Ericcson Screw Machine Prod. Inc., Brooklyn, N. Y.
Excello Corp., Detroit (Heat-Treating)
Fenn Mfg. Co., Hartford, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Hartford Special Machy. Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati
Carlyle Johnson Machine Co., Manchester, Conn.
Kent-Owens Machine Co., Toledo, O.
Kropp Forge Co., Chicago (Forgings)
Liberty Tool & Gage Wks., Providence, R. I. (Jigs & Fixtures)
Meisel Press Mfg. Co., Boston
National Acme Co., Cleveland
National Twist Drill & Tool Co., Detroit
New Britain-Gridley Machine Co., New Britain, Conn. (Screw Machine Products)
Revere Copper & Brass, Inc., N. Y. C. (Forgings)
Rhode Island Tool Co., Providence, R. I. (Drop Forgings; Heat Treating; Screw Machine Products)
Stewart Iron Wks. Co., Inc., Cincinnati
Surface Combustion Corp., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.
Watson-Stillman Co., Roselle, N. J.
Williams & Co., J. H., Buffalo, N. Y.
Woodworth Co., N. A., Ferndale, Mich.

CONTROLLERS, Motor
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland
Square D Co., Milwaukee
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

CONTROLLERS, Pressure & Temperature
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia
Lindberg Engrg. Co., Chicago

CONTROLS, Flexible-Shaft (See **SHAFTS, Flexible**)

CONTROLS, Furnace
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Brown Instrument Co., Philadelphia
Lindberg Engrg. Co., Chicago
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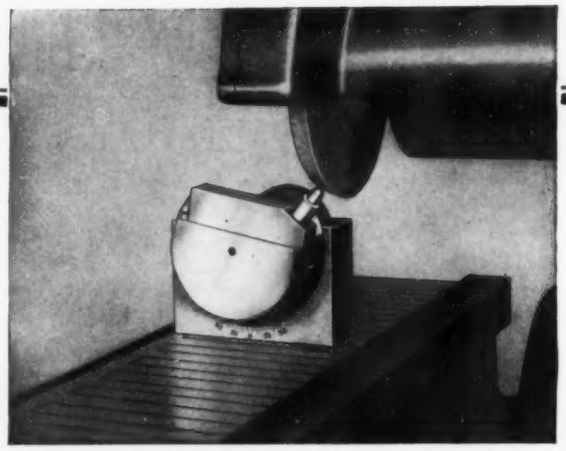

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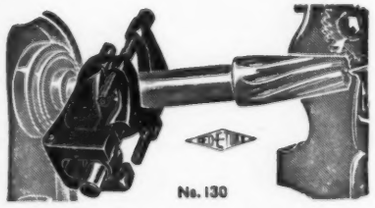

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Standard Conveyor Co., N. St. Paul, Minn.

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Gray Mills Co., Chicago

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Standard Oil Co. of Ind., Chicago
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Swan-Finch Oil Corp., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.

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Butterfield & Co., Derby Line, Vt.
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Ex-Cell-O Corp., Detroit
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Gairing Tool Co., Detroit
Genesee Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
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Vascoloy-Ramet Corp., N. Chicago, Ill.
Weldon Tool Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.

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Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
Hill Acme Co., Cleveland
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Stow Mfg. Co., Binghamton, N. Y.
Warner & Swasey Co., Cleveland

COUNTERSINKS (See DRILLS, Twist)

COUNTERS, Revolution & Stroke
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

COUPLINGS, Hose
Cleveland Pneu. Tool Co., Cleveland
Schrader's Son, A., Brooklyn, N. Y.

COUPLINGS, Shaft, Flexible
Allis-Chalmers Mfg. Co., Milwaukee
Delta Mfg. Co., Milwaukee
Earle Gear & Mach. Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Foote Bros. Gear & Mach. Co., Chicago
Hill Acme Co., Cleveland
Morse Chain Co., Ithaca, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

COUPLINGS, Shaft, Non-Flexible
Dodge Mfg. Corp., Mishawaka, Ind.
General Electric Co., Schenectady, N. Y.
Hill Acme Co., Cleveland
Standard Pressed Steel Co., Jenkintown, Pa.

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Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machy. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Portable
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Overhead Traveling
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machry. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CUSHIONS, Die
V. & O. Press Co., Hudson, N. Y.

CUTTERS, Angle
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
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Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
McCrosky Tool Co., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago

CUTTERS, Die-Sinking
Detroit Tap & Tool Co., Detroit
Gairing Tool Co., Detroit
Gorton Machine Co., Geo., Racine, Wis.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
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Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

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Carboloy Co., Detroit
Cleveland Twist Drill Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
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Weldon Tool Co., Cleveland

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Morse Tool Co., Detroit
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National Broach & Mach. Co., Detroit
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Producto Machine Co., Bridgeport, Conn.
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Standard Tool Co., Cleveland
Stow Mfg. Co., Binghamton, N. Y.
Taylor Machine Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Waltham Mach. Wks., Waltham, Mass.

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Barber-Colman Co., Rockford Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
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Davis Keyseater Co., Rochester, N. Y.
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Michigan Tool Co., Detroit
Mitts & Merrill, Saginaw, Mich.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Machine Tool Co., Cincinnati
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

CUTTERS, Milling
Atlas Press Co., Kalamazoo, Mich.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Genesee Tool Co., Detroit
Gorton Mach. Co., George, Racine, Wis.
Grayson Mfg. Co., Monrovia, Calif.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
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Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
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O. K. Tool Co., Shelton, Conn.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
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Welch Industries, Inc., Detroit
Weldon Tool Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H. Buffalo, N. Y.

CUTTERS, Wire
Ideal Commutator Dresser Co., Chicago

CUTTING-OFF MACHINES (See **SAWS**)

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Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Campbell Div., Andrew C., American Chain & Cable Co., Bridgeport, Conn.
deSanno & Sons, Inc., A. P., Philadelphia
Porter McLeod Machine Tool Co., Inc., Hatfield, Mass.
Racine Tool & Mach. Co., Racine, Wis.

CYLINDERS, Air (See **TANKS & CYLINDERS, Air**)

CYLINDERS, Hydraulic (See **PRESSES, Hydraulic**)

DEALERS, Machinery (See **Searchlight Section**)

DEGREASERS (See **Metal Cleaning Equipment**)

DEMAGNETIZERS
Abrasive Machine Tool Co., E. Providence, R. I.
Blanchard Mach. Co., Cambridge, Mass.
L-W Chuck Co., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. Worcester, Mass.
Welch Industries, Inc., Detroit

DIAMONDS, Industrial
Carboloy Co. Inc., Detroit
Crafts Co., Inc., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Diamond Tool Co., Chicago
Smit & Sons, Inc., J. K., N. Y. C.

DIE-CASTING MACHINES
Continental Machines, Inc., Minneapolis
Reed-Prentice Corp., Worcester, Mass.

DIE-HEADS, Threading
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Chaso Tool Co., Royal Oak, Mich.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap and Die Corp., Greenfield Mass.
Hill Acme Co., Cleveland
Jones & Lamson Mach. Co., Springfield Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., Cleveland

DIE-MAKERS' SUPPLIES
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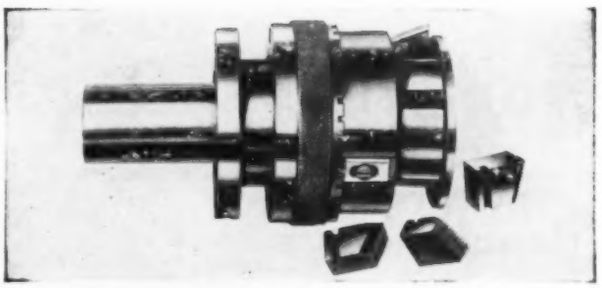
Brown & Sharpe Mfg. Co., Providence R. I.
Carboloy Co., Inc., Detroit



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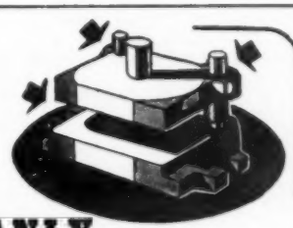

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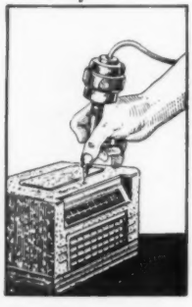

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Cunningham Co., M. E., Pittsburgh
Matthews & Co., Jas. H., Pittsburgh
Noble & Westbrook Mfg. Co., East Hartford, Conn.

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Card Mfg. Co., S. W., Mansfield, Mass.
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Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
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Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
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National Acme Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.

DIES, Sheet-Metal & Forging
Hamilton Tool Co., Hamilton, O.
Scully-Jones & Co., Chicago
Taft-Peirce Mfg. Co., Woonsocket, R. I

DIES, Solid Bolt & Pipe
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Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Consolidated Machine Tool Corp., Rochester, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Machine Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland

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Producto Machine Co., Bridgeport, Conn.
V & O Press Co., Hudson, N. Y.
Waltham Mach. Works, Waltham, Mass.

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Vascoloy-Ramet Corp., N. Chicago, Ill.

DISKS, Abrasive (See **WHEELS, Grinding & Polishing**)

DISKS, Circular Cutting
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Disston & Sons, Inc., Henry, Philadelphia
Morse Twist Drill and Machine Co., New Bedford, Mass.

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LeBlond Mach. Tool Co., R. K., Cincinnati
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Sturdimatic Tool Co., Detroit
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Metal Carbides Corp., Youngstown, O.
Smit & Sons, J. K., N. Y. C.
Standard Tool Co., Cleveland
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J & S Tool Co., E. Orange, N. J.
Norton Co., Worcester, Mass.
Schultz & Anderson Co., Newark, N. J.
Welch Industries, Inc., Detroit

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Houghton & Co., E. F., Philadelphia
Tide Water Associated Oil Co., N. Y. C.
White & Bagley, Worcester, Mass.

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DeLaval Separator Co., N. Y. C.
Tolhurst Div., American Machine & Metals, Inc., East Moline, Ill.

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Morse Twist Drill & Machine Co., New Bedford, Mass.
Standard Tool Co., Cleveland

DRILLROD, Steel Tool (See **STEEL, Tool**)

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Cross Gear and Machine Co., Detroit
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National Auto. Tool Co., Richmond, Ind.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.

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Avey Drilling Machine Co., Cincinnati
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Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
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Fosdick Machine Tool Co., Cincinnati
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Skilsaw, Inc., Chicago
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National Twist Drill & Tool Co., Detroit
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Slocomb Co., J. T., Providence, R. I.
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Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
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Fosdick Machine Tool Co., Cincinnati
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National Auto. Tool Co., Richmond, Ind.
Sibley Machine Co., South Bend, Ind.
Snyder Tool & Engrg. Co., Detroit

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National Twist Drill & Tool Co., Detroit
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Wendt Sonis Co., Hannibal, Mo.

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DRILLS, Hand (See **TOOLS, Hand**)

DRILLS, Horizontal
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Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bradford Machine Tool Co., Cincinnati
Buhr Mach. Tool Co., Ann Arbor, Mich.
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Murchey Machine and Tool Co., Detroit
National Auto. Tool Co., Richmond, Ind.
Ryerson & Son, Jos. T., Chicago
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Snyder Tool & Engrg. Co., Detroit
Universal Boring Mach. Co., Hudson, Mass.

DRILLS, Deep-Hole
Barnes Co., W. F. & John, Rockford, Ill.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLS, Multi-Spindle or Gang
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., Milwaukee
Delta Mfg. Co., Milwaukee
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
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Leland-Gifford Co., Worcester, Mass.
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National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
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Snyder Tool & Engrg. Co., Detroit

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DRILLS, Portable Pneumatic (See **TOOLS, Portable Pneumatic**)

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Bryant Machinery & Engrg. Co., Chicago
Carlton Machine Tool Co., Cincinnati
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Mach. Tool Co., Cincinnati
Cleveland Punch & Shear Works, Inc., Cleveland
Fosdick Machine Tool Co., Cincinnati
General Machy. Corp., Hamilton, O.
Leland-Gifford Co., Worcester, Mass.
Morris Machine Tool Co., Cincinnati

DRILLS, Sensitive
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Avey Drilling Machine Co., Cincinnati
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Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Dalzen Tool & Mfg. Co., Detroit
Delta Mfg. Co., Milwaukee
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Leland-Gifford Co., Worcester, Mass.
National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
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Sheldon Mach. Co., Chicago
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DRIVES, Variable-Speed (See **TRANSMISSIONS, Variable-Speed**)

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American Pulley Co., Philadelphia
Dayton Rubber Mfg. Co., Dayton, O.
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Bilgram Gear & Mach. Wks., Philadelphia
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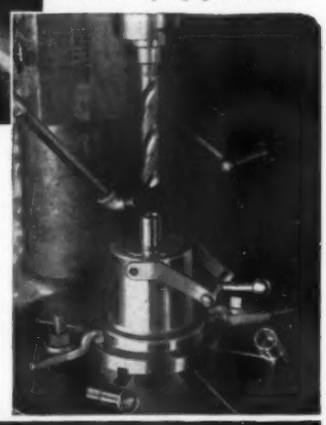

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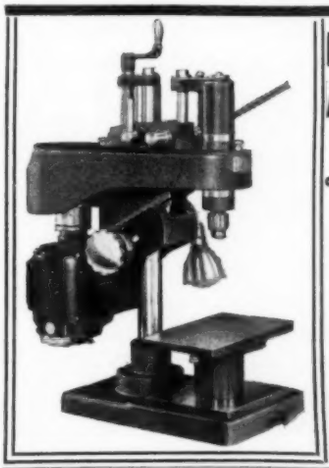

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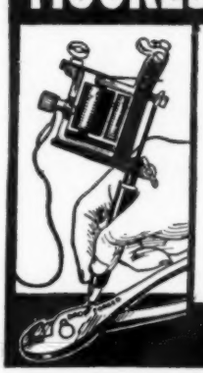

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The design of this machine is stiff and rigid. Table is supported its entire length by longitudinal slide which in turn is effectively supported on cross slide. All controls are in front of machine convenient to operator. Speeds of 3600 or 3000 RPM are available depending on current supply.

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Will grind cutters on holder, 14" dia.
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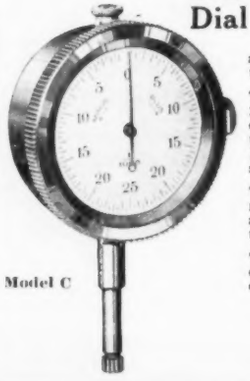

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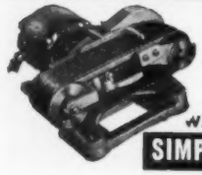

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Square D. Co., Milwaukee
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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Air Reduction, N. Y. C.
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Lincoln Electric Co., Cleveland
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Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
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Tolhurst Div., American Machine & Metals, Inc., East Moline, Ill.

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Ideal Commutator Dresser Co., Chicago
Moore Mfg. Co., Wm., Chicago
Reed-Prentice Co., Worcester, Mass.

ETCHERS, Electric
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Gorton Machine Co., Geo., Racine, Wis.
Ideal Commutator Dresser Co., Chicago

EXTRACTORS, Centrifugal Oil (See **SEPARATORS, Centrifugal**)

EXTRACTORS, Screw
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Greenfield Tap & Die Corp., Greenfield Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland

FANS, Man-Cooler (See **BLOWERS**)

FEEDS, Die (See **FEEDS, Press**)

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Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit

FEEDS, Press
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Henry & Wright Mfg. Co., Hartford, Conn.
Nilson Mach. Co., A. H., Bridgeport, Conn.
Producto Machine Co., Bridgeport, Conn.
Schrader's Sons, A., N. Y. C.
V. & O. Press Co., Hudson, N. Y.
Yoder Co., Cleveland
Zeh & Hahnemann Co., Newark, N. J.

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FILES & RASPS
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Atkins & Co., E. C., Indianapolis
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Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Inc., Binghamton, N. Y.
Strand & Co., N. A., Chicago

FILES, Rotary
Disston & Sons, Inc., Henry, Philadelphia
Hamilton Tool Co., Hamilton, O.
Strand & Co., N. A., Chicago

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Ames Co., B. C., Waltham, Mass.
Continental Machines Inc., Milwaukee
Do All Co., Inc., Des Plaines, Ill.
Illinois Tool Co., Chicago
Oliver Instrument Co., Adrian, Mich.

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FILTERS, Air
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Curtis Pneu. Machy. Co., St. Louis
Norton Company, Worcester, Mass.

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Hardinge Brothers, Inc., Elmira, N. Y.
Mitts & Merrill, Saginaw, Mich.
Rivett Lathe & Grinder, Inc., Boston

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Watson-Stillman Co., Roselle, N. J.

FITTINGS, Wire-Rope
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American Steel & Wire Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Cleveland
Roebling's Sons Co., John A., Trenton, N. J.

FIXTURES, Indexing
Brown & Sharpe Mfg. Co., Providence, R. I.
Hartford Special Machinery Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati
Zagar Tool Inc., Cleveland

FLAME-CUTTING MACHINES
Air Reduction, N. Y. C.
Oster Mfg. Co., Cleveland

FLEXIBLE SHAFT EQUIPMENT
Foredom Electric Co., N. Y. C.
Haskins Mfg. Co., R. G., Chicago
Morris Ltd., B. O., Birmingham, Eng.
Strand Mfg. Co., N. A., Chicago

FLUX, Liquid & Paste
Air Reduction, N. Y. C.
Atkins & Co., E. C., Indianapolis
Eutetic Welding Alloys, Inc., N. Y. C.
Lincoln Electric Co., Cleveland

FORGES
Buffalo Forge Co., Buffalo, N. Y.

FORGING MACHINES (See also **PRESSES, Forging**)
Ajax Mfg. Co., Euclid, Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Hill Acme Co., Cleveland

FORGINGS (See **Contract Work**)

FORMING MACHINES
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Wks., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
Elmes Engrg. Works, Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Watson-Stillman Co., Roselle, N. J.
Yoder Co., Cleveland
Zeh & Hahnemann Co., Newark, N. J.

FURNACES, Electric
General Electric Co., Schenectady, N. Y.
Lindberg Engrg. Co., Chicago
Surface Combustion Corp., Toledo, O.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

FURNACES, Gas
American Gas Furn. Co., Elizabeth, N. J.
Chicago Flexible Shaft Co., Chicago
Despatch Oven Co., Minneapolis
Hones, Inc., Chas. A. Baldwin, N. Y.
Lindberg Engrg. Co., Chicago
Stark Tool Co., Waltham, Mass.
Strong, Carlisle & Hammond Co., Cleveland
Surface Combustion Corp., Toledo, O.

FURNACES, Oil
Chicago Flexible Shaft Co., Chicago
Despatch Oven Co., Minneapolis
Surface Combustion Corp., Toledo

FURNITURE, Shop
Black & Decker Mfg. Co., Towson, Md. (Drill Stands)

WHERE-TO-BUY DIRECTORY

Hamilton Tool Co., Hamilton, O.
New Britain-Gridley Machine Co., New Britain, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

GAGES, Amplifying
Federal Products Corp., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Van Keuren Co., Watertown, Mass.

GAGES, Caliper
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator
Ames Co., B. C. Waltham, Mass.
Federal Products Corp., Providence, R. I.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Continental Machines, Inc., Minneapolis
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.

GAGES, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Drill-Center
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Morse Twist Drill Co., New Bedford, Mass.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

GAGES, Height
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Lufkin Rule Co., Saginaw, Mich.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

GAGES, Plug & Ring
Brown & Sharpe Mfg. Co., Providence, R. I.
Cadillac Gage Co., Detroit
Carboloy Co., Detroit
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Lincoln Park Tool & Gage Co., Lincoln Park, Mich.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Turner Gage Grinding Co., Ferndale, Mich.
Vard, Inc., Pasadena, Calif.
Van Keuren Co., Watertown, Mass.

GAGES, Pressure
Baldwin-Southwark Corp., Philadelphia
Brown Instrument Co., Philadelphia

GAGES, Profile
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Snap (See GAGES, Plug & Ring)

GAGES, Surface
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

GAGES, Thickness
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Randall & Stickney Co., Waltham, Mass
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence, R. I
Cadillac Gage Co., Detroit
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Mach. Co., Hartford, Conn
Lufkin Rule Co., Saginaw, Mich.
Michigan Tool Co., Detroit
Perfex Gage & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T. Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I
Vard, Inc., Pasadena, Calif.

GAGES, Wire
Atkins & Co., E. C., Indianapolis
Brown & Sharpe Mfg. Co., Providence, R. I
Disston & Sons, Inc., Henry, Philadelphia
Federal Products Corp., Providence, R. I
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.

GALVANIZING MACHINES (See ENAMELING & GALVANIZING MACHINES)

GASES, Compressed
Air Reduction, N. Y. C.

GEAR-CUTTING MACHINES
Adams Co., Dubuque, Iowa
Barber-Colman Co., Rockford, Ill.
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Cleveland Hobbing Mach. Co., Cleveland
Colonial Broach Co., Detroit
Cross Gear & Machine Co., Detroit
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt
General Mach. Corp., Hamilton, O.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
Newark Gear Cutting Mach. Co., Newark
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn
Scherr Co., Inc., Geo., N. Y. C.
Waltham Mach. Wks., Waltham, Mass.

GEAR-TESTING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I
Farrel-Birmingham Co., Buffalo, N. Y
Fellows Gear Shaper Co., Springfield, Vt
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.

GEARS, Cast
Braun Gear Corp., Brooklyn, N. Y.
Dodge Mfg. Corp., Mishawaka, Ind.
Earle Gear & Machine Co., Philadelphia
Fairfield Mfg. Co., Lafayette, Ind.
Farrel-Birmingham Co., Ansonia, Conn
Foote Bros. Gear & Mach. Co., Chicago
Ganschow Gear Co., Chicago
General Electric Co., Schenectady, N. Y
Grant Gear Works, Inc., Boston
Ohio Gear Co., Cleveland
Perkins Machine & Gear Co., Springfield Mass.
Philadelphia Gear Works, Philadelphia

GEARS, Cut
Adams Co., Dubuque, Iowa
Allis-Chalmers Mfg. Co., Milwaukee
Baush Mach. Tool Co., Springfield, Mass
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Braun Gear Corp., Brooklyn, N. Y.
Carlyle Johnson Machine Co., Manchester, Conn.
Cincinnati Gear Co., Cincinnati
Cincinnati Lathe & Tool Co., Cincinnati
Detroit Bevel Gear Co., Detroit
Earle Gear & Machine Co., Philadelphia
Fairfield Mfg. Co., Lafayette, Ind.
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Foote Bros. Gear & Mach. Co., Chicago
Ganschow Gear Co., Chicago
Gear Specialties Inc., Chicago
Gleason Works, Rochester, N. Y.
Grant Gear Works, Inc., Boston
Hartford Special Machinery Co., Hartford, Conn.
Meisel Press Mfg. Co., Boston
Michigan Tool Co., Detroit
Morse Chain Co., Ithaca, N. Y.
Ohio Gear Co., Cleveland
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia
Sier-Bath Gear Co., North Bergen, N. J.
Stahl Gear & Machine Co., Cleveland

GEARS, Master
Earle Gear & Mach. Co., Philadelphia
Fellows Gear Shaper Co., Springfield, Vt.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

GEARS, Non-Metallic
Adams Co., Dubuque, Iowa
Bakelite Corp., N. Y. C.
Bilgram Gear & Mach. Wks., Philadelphia
Braun Gear Corp., Brooklyn, N. Y.
Earle Gear & Machine Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
General Electric Co., Schenectady, N. Y.
Grant Gear Works Inc., Boston
Hartford Special Machinery Co., Hartford, Conn.
James Co., D. O., Chicago
Meisel Press Mfg. Co., Boston
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia
Sier-Bath Gear Co., North Bergen, N. J.
Stahl Gear & Machine Co., Cleveland
Taylor Machine Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

GOGGLES, Face Shields & Sweat Bands
American Optical Co., Southbridge, Mass.

GRAINS, Abrasive
Bay State Abrasive Prod. Co., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div., Tiffin, O.

GRINDERS, Abrasive-Belt
Delta Mfg. Co., Milwaukee
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Mattison Machine Works, Rockford, Ill.
Midwest Abrasive Co., Detroit
Porter Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Walker-Turner Co., Inc., Plainfield, N. J.
Walls Sales Corp., N. Y. C.

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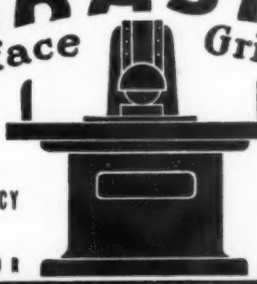

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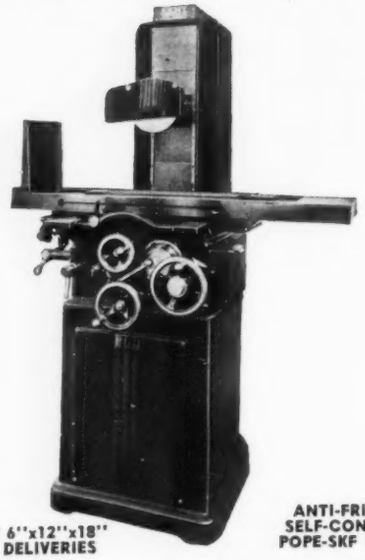

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Delta Mfg. Co., Milwaukee
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Hardinge Brothers, Inc., Elmira, N. Y.
Hobart Brothers, Troy, Ohio
Norton Co., Worcester, Mass.
Porter Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Queen City Machine Tool Co., Cincinnati
Schauer Machine Co., Cincinnati
Stow Mfg. Co., Binghamton, N. Y.
Union Twist Drill Co., Athol, Mass.
Vonnegut Moulder Corp., Indianapolis
Walker Co., O. S., Worcester, Mass.
Walker-Turner Co., Plainfield, N. J.
Walls Sales Corp., N. Y. C.

GRINDERS, Cam
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDERS, Carbide Tool
Blount Co., J. G., Everett, Mass.
Ex-Cell-O Corp., Detroit
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.

GRINDERS, Centerless
Cincinnati Grinders, Inc., Cincinnati
Heald Machine Co., Worcester, Mass.
Metal Carbides Corp., Youngstown, O.

GRINDERS, Chucking
Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Fitchburg Grinding Mach. Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDERS, Contour
Baker Bros., Inc., Toledo, Ohio
Blanchard Machine Co., Cambridge, Mass.
Thompson Grinder Co., Springfield, O.

GRINDERS, Cutter & Tool
Abrasive Mach. Tool Co., E. Providence, R. I.
Barber-Colman Co., Rockford, Ill.
Blount Co., J. G., Everett, Mass.
Boggis & Co., H. P., Cleveland
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
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Delta Mfg. Co., Milwaukee
Ex-Cell-O Corp., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
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General Machinery Corp., Boston
Geometric Tool Co., New Haven, Conn.
Gorton Machine Co., Geo., Racine, Wis.
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Kearney & Trecker Co., Milwaukee
Landis Machine Co., Waynesboro, Pa.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati
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Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
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Sellers & Co., Inc., Wm., Philadelphia
Standard Tool Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Thompson Grinder Co., Springfield, O.
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester, Mass.

GRINDERS, Cylindrical
Arter Grinding Mach. Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Grinders, Inc., Cincinnati
Dumore Co., Racine, Wis.
Farrel-Birmingham Co., Ansonia, Conn.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., Bedford, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Norton Co., Worcester, Mass.
Thompson Grinder Co., Springfield, O.

GRINDERS, Disk
Delta Mfg. Co., Milwaukee
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Gardner Machine Co., Beloit, Wis.
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Lempco Products, Inc., Bedford, O.
Porter Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Queen City Mach. Tool Co., Cincinnati
Walls Sales Corp., N. Y. C.

GRINDERS, Drill & Tap
Blake Co., Edward, Newton Center, Mass.
Covel Mfg. Co., Benton Harbor, Mich.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Oliver Instrument Co., Adrian, Mich.
Sellers & Co., Wm., Philadelphia
Union Twist Drill Co., Athol, Mass.

GRINDERS, Face or Ring Wheel
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Blanchard Machine Co., Cambridge, Mass.
Blount Co., J. G., Everett, Mass.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Bickford Tool Co., Oakley, Cincinnati
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Lempco Products, Inc., Bedford, O.

GRINDERS, Gear
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Gear Grinding Machine Co., Detroit
Gleason Works, Rochester, N. Y.

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Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Hartford Special Machinery Co., Hartford, Conn.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., Bedford, O.
Rivett Lathe & Grinder, Inc., Boston
Sav-Way Tool & Mach. Co., Detroit
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Thompson Grinder Co., Springfield, O.
Van Norman Machine Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.

GRINDERS, Jig
Moore Spec. Tool Co., Bridgeport, Conn.

GRINDERS, Knife & Shear-Blade
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Hill Acme Co., Cleveland
Mattison Machine Works, Rockford, Ill.

GRINDERS, Lathe-Attachment (See ATTACHMENTS, Lathe)

GRINDERS, Portable Electric (See also TOOLS, Portable Electric)
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Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine Wis.
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
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Porter-Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rotor Tool Co., Cleveland

GRINDERS, Spline
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDERS, Surface
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Blanchard Mach. Co., Cambridge, Mass.
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Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Covel Mfg. Co., Benton Harbor, Mich.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gardner Machine Co., Beloit, Wis.
Hammond Machy. Builders, Inc., Kalamazoo, Mich.
Heald Machine Co., Worcester, Mass.
Hill Acme Co., Cleveland
Landis Tool Co., Waynesboro, Pa.
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Mattison Machine Works, Rockford, Ill.
Murchey Machine & Tool Co., Detroit
Norton Co., Worcester, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Thompson Grinder Co., Springfield, O.
Van Norman Machine Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.

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Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Jefferson Machine Tool Co., Cincinnati
Vonnegut Moulder Corp., Indianapolis

GRINDERS, Thread
Ex-Cello-O Corp., Detroit
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.

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Cincinnati Grinders, Inc., Cincinnati
Covel Mfg. Co., Benton Harbor, Mich.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati
Morse Twist Drill & Machine Co., New Bedford, Mass.
Norton Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Thompson Grinder Co., Springfield, O.

GRINDING, Centerless (See CONTRACT WORK)

GRINDING FIXTURES
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GROOVERS, Oil
Hanson-Whitney Mach. Co., Hartford, Conn.
National Machine Tool Co., Cincinnati

GUARDS & SAFETY APPLIANCES, Machinery
Littleford Bros., Cincinnati
Schrader's Son, A., Brooklyn, N. Y.

HACK SAW BLADE GRINDING FIXTURES (See GRINDING FIXTURES)

HAMMERS, Drop
Farrel-Birmingham Co., Ansonia, Conn.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

HAMMERS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.
Cleveland Pneu. Tool Co., Cleveland

HAMMERS, Power
General Machinery Corp., Hamilton, O.
Murray Mfg. Co., D. J., Wausau, Wis.
Sellers & Co., Wm., Philadelphia

HAMMERS, Softfaced
Greene, Tweed & Co., N. Y. C.
Johnson Tool Co., Inc., E. Providence, R. I.

HANDLES, Crank & Machine
Machine Products Corp., Detroit
Williams & Co., J. H., Buffalo, N. Y.

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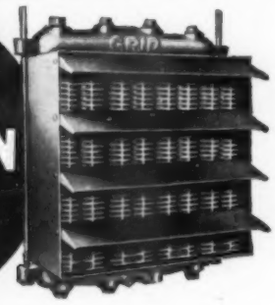

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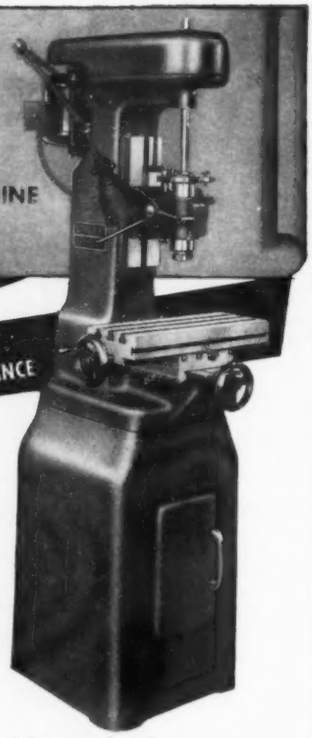

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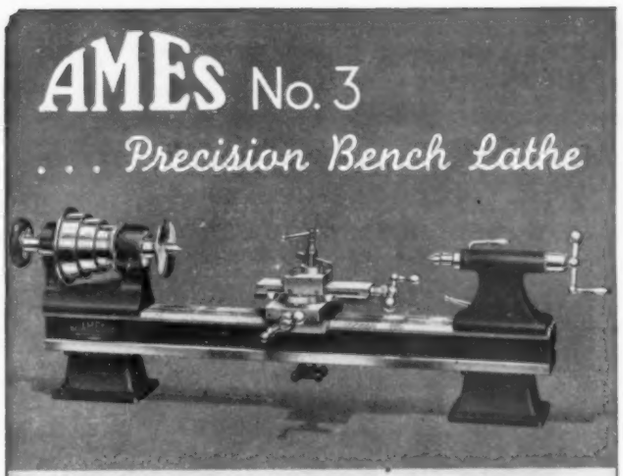

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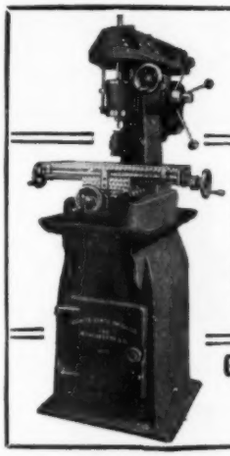

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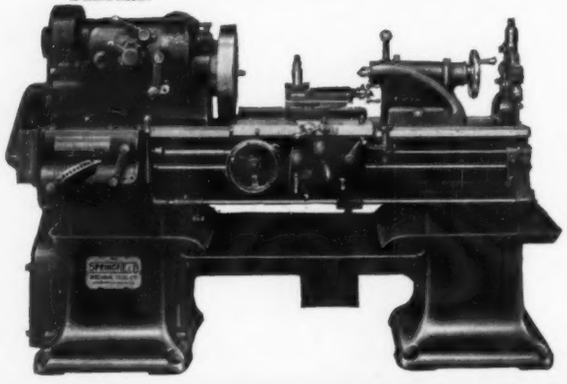

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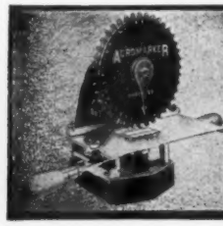

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Littleford Bros., Cincinnati

MAGNETS, Lifting
General Electric Co., Schenectady, N. Y.

MALLETS (See TOOLS, Hand)

MANDRELS, Air Operated
Nicholson & Co., W. H., Wilkes-Barre, Pa.

MANDRELS, Expanding
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Kearney & Trecker Corp., Milwaukee
Morse Twist Drill & Machine Co., New Bedford, Mass.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Producto Machine Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.

MANDRELS, Solid (See ARBORS & MANDRELS)

MARKING MACHINES
Acromark Co., Elizabeth, N. J.
Gorton Machine Co., Geo., Racine, Wis.
Mathews & Co., James H., Pittsburgh
Moore Mfg. Co., Wm., Chicago
Noble & Westbrook Mfg. Co., East Hartford, Conn.
Numberall Stamp & Tool Co., Huguenot Park, N. Y.

MASKS (See RESPIRATORS)

MEASURING EQUIPMENT, Light Wave
Van Keuren Co., Watertown, Mass.

METAL-CLEANING EQUIPMENT
Barrett Co., Leon J., Worcester, Mass.
Barry-Wehmiller Machry. Co., St. Louis, Mo.
Bullard Co., Bridgeport, Conn.
Detroit Rex Products Co., Detroit
Hobart Bros. Co., Troy, O.
Stow Mfg. Co., Inc., Binghamton, N. Y.
Tolhurst Div., American Machine & Metals, Inc., East Moline, Ill.

METALS, Bearing
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., New Castle, Pa.
National Bearing Metals Corp., St. Louis
Ryerson & Son, Jos. T., Chicago
Westinghouse Electric & Mfg. Co., E. Pittsburgh

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Central Tool Co., Auburn, R. I.
Davis & Thompson Co., Milwaukee
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Randall & Stickney, Waltham, Mass.
Scherr Co., Inc., George, N. Y. C.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

MICROSCOPES
Scherr Co., Geo., N. Y. C.

MILLERS, Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Fitchburg Engrg. Corp., Fitchburg, Mass.
Kearney & Trecker Corp., Milwaukee
Kent-Owens Machine Co., Toledo, O.
Producto Machine Co., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLERS, Bench
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
Burke Machine Tool Co., Conneaut, O.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati,
Linley Bros. Co., Bridgeport, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Stark Tool Co., Waltham, Mass.

MILLERS, Duplex
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., Milwaukee

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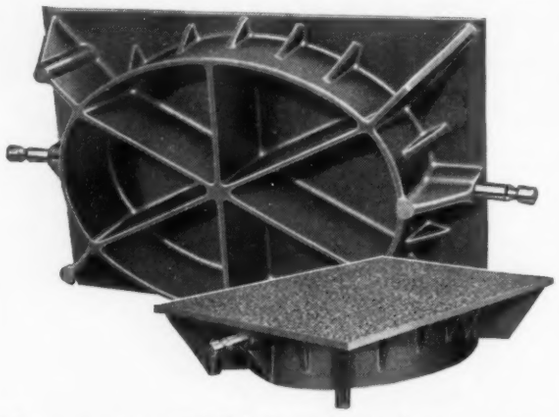

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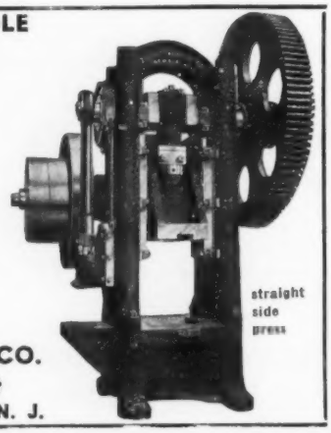
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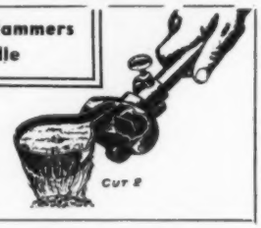
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East Providence Rhode Island, U.S.A.

PRESSES
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AUTOMATIC EQUIPMENT
THE V&O Press Co, INC.
HUDSON, N. Y.

WHERE-TO-BUY DIRECTORY

Fitchburg Engrg. Corp., Fitchburg, Mass.
General Machinery Corp., Hamilton O.
Kearney & Trecker Corp., Milwaukee
Producto Machine Co., Bridgeport, Conn.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

MILLERS, Hand
Atlantic Machinery Co., N. Y. C.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kent-Owens Machine Co., Toledo, O.
Lucas & Sons, Inc., J. L., Bridgeport, Conn.
Nichols & Sons, W. H., Waltham, Mass.
Producto Machine Co., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool. Co., Springfield, Mass.

MILLERS, Plain & Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Douglas Machinery Co., Inc., N. Y. C.
Fray Mach. Tool Co., Glendale, Calif.
Gorton Machine Co., Geo., Racine, Wis.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kearney & Trecker Corp., Milwaukee
Kempsmith Machine Co., Milwaukee
Kent-Owens Machine Co., Toledo, O.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Knight Machinery Co., W. B., St. Louis
Machinery Mfg. Co., Chicago
Nichols & Sons, W. H., Waltham, Mass.
Ohio Machine Tool Co., Kenton, O.
Producto Machine Co., Bridgeport, Conn.
Sidney Machine Tool Co., Sidney, O.
Van Norman Machine Tool Co., Springfield, Mass.

MILLERS, Planer Type
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Fitchburg Engrg. Corp., Fitchburg, Mass.
General Machinery Corp., Hamilton, O.
Gidding & Lewis Mach. Tool Co., Fond du Lac, Wis.
Kearney & Trecker Corp., Milwaukee
Sellers & Co., Inc., Wm., Philadelphia

MILLERS, Planetary
Hall Planetary Co., Philadelphia
Plan-O-Mill Corp., Royal Oak, Mich.

MILLERS, Profile
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Machine Co., Geo., Racine, Wis.
Knight Machinery Co., W. B., St. Louis
Morey Machinery Co., Inc., N. Y. C.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.

MILLERS, Thread
Adams Co., Dubuque, Iowa
Cleveland Auto. Mach. Co., Cleveland
Coulter Mach. Co., Jas., Bridgeport, Conn.
Hanson-Whitney Mach. Co., Hartford, Conn.
Lees-Bradner Co., Cleveland
Plan-O-Mill Corp., Royal Oak, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scherr Co., Inc., Geo., N. Y. C.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Works, Waltham, Mass.

MILLERS, Vertical
Blank & Buxton Machy. Co., Jackson, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Coulter Machine Co., James, Bridgeport, Conn.
General Machinery Corp., Hamilton, O.
Gorton Machine Co., Geo., Racine, Wis.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kearney & Trecker Corp., Milwaukee
Kempsmith Mfg. Co., Milwaukee
Kent-Owens Machine Co., Toledo, Ohio
Knight Machinery Co., W. B., St. Louis
Linley Bros. Co., Bridgeport, Conn.
Machinery Mfg. Co., Los Angeles
Morey Machinery Co., Inc., N. Y. C.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.
Sidney Machine Tool Co., Sidney, O.
Sommer & Adams Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Machine Tool Co., Springfield, Mass.

MOLDING MACHINES, Plastic
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Reed-Prentice Corp., Worcester, Mass.
Watson-Stillman Co., Roselle, N. J.

MOLDS, Lead Hammer
Johnson Tool Co., Inc., E. Providence, R. I.

MOTORS, Electric
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Century Electric Co., St. Louis
Dumore Co., Racine, Wis.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Howell Elec. Motors Co., Howell, Mich.
Lincoln Electric Co., Cleveland
Reliance Elec. & Engrg. Co., Cleveland
Wagner Electric Corp., St. Louis
Wesche Electric Co., B. A., Cincinnati
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

MOTORS, Geared (See **MOTORS, Electric**)

MOTORS, Hydraulic (see also **PUMPS, Hydraulic**)
Racine Tool & Mach. Co., Racine, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit

NAMEPLATES
Acromark Co., Elizabeth, N. J.
Matthews & Co., Jas. H., Pittsburgh
Noble & Westbrook Mfg. Co., Hartford, Conn.

NIBBLERS
Campbell, Andrew C., Div. Amer. Chain & Cable Co., Bridgeport, Conn.
Mitts & Merrill, Saginaw, Mich.
Savage Tool Co., Savage, Minn.

NOZZLES, Blast-Cleaning
Norton Company, Worcester, Mass.
Schrader's Sons, A., N. Y. C.

NUMBERING MACHINES (See **MARKING MACHINES**)

NUT-BLANKING MACHINES
Cleveland Automatic Mach. Co., Cleveland
National Acme Co., Cleveland
Potter & Johnston Machine Co., Pawtucket, R. I.

OIL STONES (See **STONES, Sharpening**)

OILERS, Automatic (See **LUBRICATING SYSTEMS**)

OILS, Cutting
Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
National Refining Co., Cleveland
Racine Tool & Mach. Co., Racine, Wis.
Shell Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind.), Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Swan-Finch Oil Corp., N. Y. C.
Texas Co., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.
White & Bagley Co., Worcester, Mass.

OILS & GREASES (See **LUBRICANTS**)

OILS, Hydraulic
Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Shell Oil Co. Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind.), Chicago
Sun Oil Co., Philadelphia
Texas Co., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.

OILS, Quenching & Tempering
Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Shell Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind.), Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Texas Co., N. Y. C.
Tidewater Oil Co., N. Y. C.

WHERE-TO-BUY DIRECTORY

OVENS, Gas Fired
Despatch Oven Co., Minneapolis

PACKING, Hydraulic
Elmes Engrg. Wks., Chas. F., Chicago
Greene, Tweed & Co., N. Y. C.
Houghton & Co., E. F., Philadelphia
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Watson-Stillman Co., Roselle, N. J.

PAINTS, Varnishes, etc.
Devoe & Raynolds Co., Inc., N. Y. C.

PAPER & CLOTH, Abrasive
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

PHOSPHOR BRONZE
Bunting Brass & Bronze Co., Toledo
Johnson Bronze Co., New Castle, Pa.

PICKLING MACHINES (See METAL-CLEANING EQUIPMENT)

PINS, Dowel & Taper
Allen Mfg. Co., Hartford, Conn.
American Steel & Wire Co., Cleveland
Bethlehem Steel Co., Bethlehem, Pa.
Danly Machine Specialties, Inc., Chicago
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland

PIPE CUTTING & THREADING MACHINES
Armstrong Bros. Tool Co., Chicago
Bardons & Oliver, Inc., Cleveland
Cleveland Automatic Mach. Co., Cleveland
Hill Acme Co., Cleveland
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Peerless Machine Co., Racine, Wis.
Rickert-Shafer Co., Erie, Pa.
Scherr Co., Inc., Geo., N. Y. C.
Warner & Swasey Co., Cleveland

PLANERS
Cincinnati Planer Co., Cincinnati
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Liberty Planers, Inc., Hamilton, O.
Ohio Machine Tool Co., Kenton, O.
Rockford Mach. Tool Co., Rockford, Ill.
Sellers & Co., Inc., Wm., Philadelphia

PLANERS, Plate
Baldwin-Southwark Corp., Philadelphia
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Ohio Machine Tool Co., Kenton, O.
Sellers & Co., Wm., Philadelphia

PLATES, Angle
Brown & Sharpe Mfg. Co., Providence, R. I.
Lombard Governor Corp., Ashland, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

PLATES, Surface
Baumbach Mfg. Co., E. A., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Mfg. Co., Milwaukee
Lombard Governor Corp., Ashland, Mass.
Machine Products Corp., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Smith Tool & Engrg. Wks., Inc., Bucyrus, Ohio
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

PLATFORMS, SKID (See TRUCKS, Hand Lift)

PLATING, Brass, Chromium, Copper
Chromium Corp. of Amer., N. Y. C.
Industrial Chromium Corp., Holyoke, Mass.
United Chromium Corp., N. Y. C.

PLATING EQUIPMENT & SUPPLIES
Udylite Corp., Detroit
United Chromium Corp., N. Y. C.

PLATING, Spot
Industrial Chromium Corp., Holyoke, Mass.

POTENTIOMETERS
Brown Instrument Co., Philadelphia
General Electric Co., Schenectady, N. Y.

POTS, Melting
Farrell-Birmingham Co., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Hones, Inc., Chas. A., Baldwin, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

PRESSES, Arbor
American Broach & Machine Co., Ann Arbor, Mich.
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Engrg. Wks., Chas. F., Chicago
Fameo Machine Co., Racine, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lempco Products, Inc., Bedford, O.
Lucas Machine Tool Co., Cleveland
Nicholson & Co., W. H. Wilkes-Barre, Pa.
Producto Machine Co., Bridgeport, Conn.
Sheldon Machine Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.
Wilson, K. R., Buffalo, N. Y.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

PRESSES, Crank (See PRESSES, Power)

PRESSES, Foot
Etna Machine Co., Toledo, O.
Fameo Machine Co., Racine, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Mach. Co., A. H., Bridgeport, Conn.
V. & O. Press Co., Hudson, N. Y.

PRESSES, Forging
Baldwin-Southwark Corp., Philadelphia
Beatty Mach. & Mfg. Co., Hammond, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Clearing Machine Corp., Chicago
Cleveland Punch & Shear Works Co., Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Hill Acme Co., Cleveland
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES, Hydraulic
American Broach & Machine Co., Ann Arbor, Mich.
Atlas Press Co., Kalamazoo, Mich.
Baldwin-Southwark Corp., Philadelphia
Beatty Mach. & Mfg. Co., Hammond, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Clearing Machine Corp., Chicago
Colonial Broach Co., Detroit
Davis Keyseater Co., Rochester, N. Y.
Elmes Engrg. Wks., Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
General Machinery Corp., Hamilton, O.
Hydraulic Press Mfg. Co., Mt. Gilead, O
Lapointe Mach. Tool Co., Hudson, Mass.
Lempco Products, Inc., Bedford, O.
Tomkins-Johnson Co., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.
Wright Mfg. Div. Amer. Chain Co. Inc., Bridgeport, Conn.

PRESSES, Power (Punch)
Beatty Mach. & Mfg. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Clearing Mach Co., Chicago
Cleveland Crane & Engrg. Co., Steelweld Machry. Div., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., Cleveland.
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis Keyseater Co., Rochester, N. Y.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hendey Machine Co., Torrington, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Kent-Owens Machine Co., Toledo, O.
Lempco Products, Inc., Bedford, O.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Mach. Co., A. H. Bridgeport, Conn.
Ryerson & Son, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.

SIMPLE DESIGN

• Fewer Parts
• Less Wear
WITH

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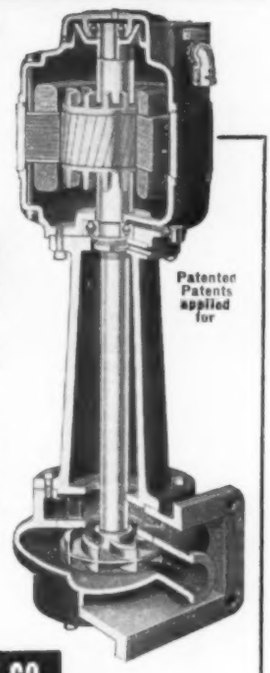

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All packing nuts are eliminated—an advantage of vertical construction—therefore, no friction or binding. No metal-to-metal contact. No foot or relief valves—yet there is no leakage. Not harmed by chips and grit. No strainers necessary. Saves power. Speeds production.

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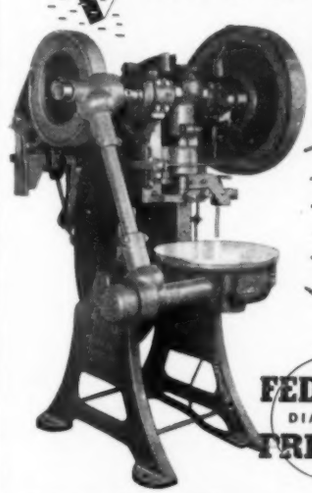
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

V for *Variety* of jobs they can do



★ Burnishing
★ Forming
★ Marking
★ Staking
★ Assembly
★ Combinations

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DIAL FEED
PRESSES

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Federal Open-Back, Inclinable Presses are available in nine sizes, with capacities ranging from six to 80 tons—either flywheel or geared type. They are the products of 40 years' experience in press building.

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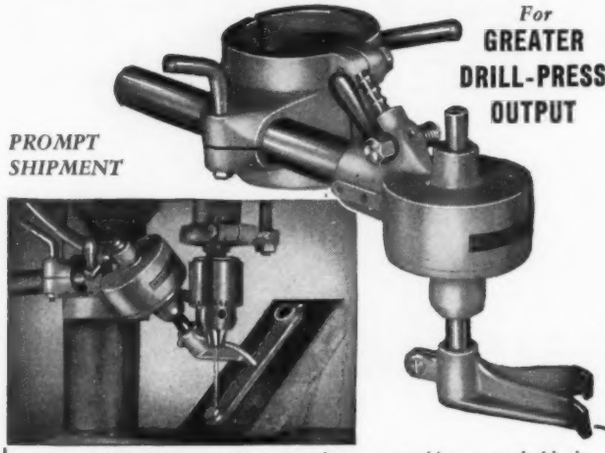
611 Division St., Elkhart, Indiana.

NEW MEAD AIR-CLAMP

For
GREATER DRILL-PRESS OUTPUT

PROMPT SHIPMENT



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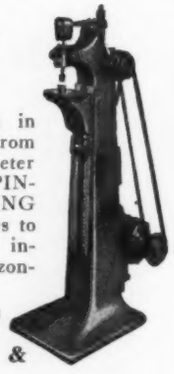

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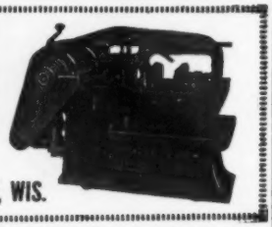

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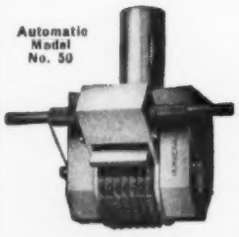

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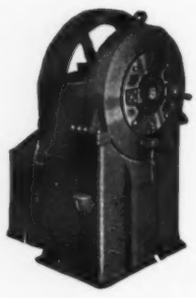

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Eastern Machine Screw Corp., New Haven, Conn.
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Morey Machinery Co., Inc., N. Y. C.

SHIMS, Bearing, Plain & Laminated
Laminated Shim Co., Glenbrook, Conn.

SHIPPING SERVICE
Railway Express, All Principal Cities

SKIDS (See TRUCKS, Hand)

SLEEVES & SOCKETS, Drill
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

SLOTTERS
Baker Bros., Inc., Toledo, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Douglas Machinery Co., Inc., N. Y. C.
General Machinery Corp., Hamilton, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

SOCKETS, Drill (See SLEEVES & SOCKETS, Drill)

WHERE-TO-BUY DIRECTORY

SOLVENTS, Oil & Grease
Detroit Rex Products Co., Detroit
Oakite Products, Inc., N. Y. C.

SPINDLES, Machine
Bryant Chucking Grinder Co., Springfield, Vt.
Dumore Co., Racine, Wis.
Ex-Cell-O Corp., Detroit
Heald Machine Co., Worcester, Mass.
Monarch Machine Tool Co., Sidney, O.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago

SPRAYERS, Paint
Ideal Commutator Dresser Co., Chicago

SPRINGS, Die
Allen Mfg. Co., Hartford, Conn.
Danly Machine Specialties, Chicago

SPROCKETS (See **GEARS, Cut**)

SQUARES, Precision (See **BLOCKS, Precision Gage**)

STAMPINGS, Metal
Acromark Corp., Elizabeth, N. J.
American Brass Co., Waterbury, Conn.
Continental Machines, Inc., Minneapolis
Revere Copper & Brass Inc., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.
Sundstrand Mach. Tool Co., Rockford, Ill.

STAMPS & HOLDERS, Steel, Safety
Acromark Corp., Elizabeth, N. J.
Cunningham Co., M. E., Pittsburgh
Moore Mfg. Co., Wm., Chicago
Noble & Westbrook Mfg. Co., East Hartford, Conn.

STAMPS, Steel (See **DIES, Marking & Embossing**)

STARTERS, Motor (See **CONTROLLERS, Motor**)

STEEL, Die
Allegheny Ludlum Steel Corp., Pittsburgh
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube, Div., Canton, O.
Vanadium Alloys Steel Co., Pittsburgh

STEEL-MILL PRODUCTS
Allegheny-Ludlum Steel Corp., Pittsburgh (Steel and stainless steel sheets, plates, tubes, wire and strip)
American Steel & Wire Co., Cleveland (Cold-finished bars, wire and wire products)
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., Cleveland (Tubing)
Boker & Co., Inc., H., N. Y. C.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Jones & Laughlin Steel Corp., Pittsburgh
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
Union Drawn Steel Co., Massillon, O. (Cold-finished)
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh

STEEL, Stainless (See preceding classification)

STEEL, Tool
Allegheny-Ludlum Steel Corp., Pittsburgh
Armstrong Bros. Tool Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Climax Molybdenum Co., N. Y. C.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Crobalt Inc., Ann Arbor, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
United States Steel Corp., Pittsburgh
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy Co., Inc., Cambridge, Mass.

STERILIZERS, Oil
Barrett Co., Leon J., Worcester, Mass.

STOCKS, Dies & Cutters, Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Tool Co., Cleveland

STONES, Sharpening
Bay State Abrasive Products Co., Westboro, Mass.
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

STRAIGHTEDGES (See **DIE-MAKERS' SUPPLIES**)

STRAIGHTENERS, Wire
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

STRAIGHTENING & SIZING MACHINES
Taylor Wilson Mfg. Co., McKees Rocks, Pa.

STRIPPERS, Wire
Ideal Commutator Dresser Co., Chicago

SUB-PRESSES & DIES (See **Dies, Subpress**)

SUPERFINISHING EQUIPMENT
Ultra-Lap Mach. Co., Detroit

SURFACE-BROACHING MACHINES (See **BROACHING MACHINES**)

SURFACE PLATES (See **PLATES, Surface**)

SWAGING MACHINES
Etna Machine Co., Toledo
Torrington Co., Torrington, Conn.

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Adam Electric Co., Frank, St. Louis
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Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Brown Instrument Co., Philadelphia
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
L-W Chuck Co., Toledo, O.
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SWITCHES, Limit
Allen-Bradley Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
National Acme Co., Cleveland
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SYSTEMS, Production & Tool Control
McCaskey Register Co., Alliance, O.

TABLES, Elevating Portable
Hamilton Tool Co., Hamilton, O.

TACHOMETERS (See **INDICATORS Speed**)

TANKS & CYLINDERS, Air
Anker Holth Mfg. Co. (Airgrip Chuck Div.) Port Huron, Mich.
Clearing Machine Corp., Chicago
Curtis Pneu. Machinery Co., St. Louis
National Tube Co., Pittsburgh
Tomkins-Johnson Co., Jackson, Mich.

TAPER PINS (See **PINS, Dowel & Taper**)

TAPES, Measuring
Lufkin Rule Co., Saginaw, Mich.
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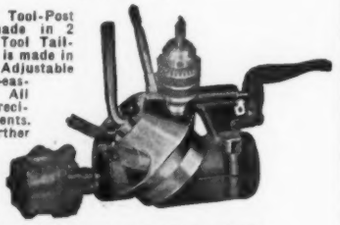

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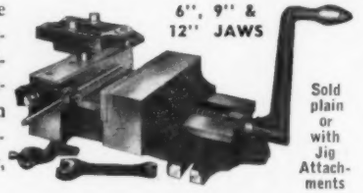

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Bodine Corp., Bridgeport, Conn.
Boice-Crane Co., Toledo, O.
Bradford Mach. Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati-Gilbert Machine Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Etteo Tool Co., Brooklyn, N. Y.
Foote-Burt Co., Cleveland
Geometric Tool Co., New Haven, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Haskins Co., R. G. Chicago
Hill Acme Co., Cleveland
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Auto. Tool Co., Richmond, Ind.
Rickert-Shafer Co., Erie, Pa.
Snyder Tool & Engrg. Co., Detroit

TAPS, Adjustable (See **DIES, Adjustable**)

TAPS, Hand & Machine, Solid
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Landis Machine Co., Waynesboro, Pa.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Wood & Spencer Co., Cleveland

TESTING EQUIPMENT, Tension & Compression
Baldwin-Southwark Corp., Philadelphia
Hartford Special Machinery Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.

THREADING MACHINES, Die-Head
Brown & Sharpe Mfg. Co., Providence, R. I.
Dalzen Tool & Mfg. Co., Detroit
Eastern Mach. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., Detroit
Geometric Tool Co., New Haven, Conn.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., Cleveland
Lees-Bradner Co., Cleveland
Murchey Machine & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Wks., Waltham, Mass.
Warner & Swasey Co., Cleveland

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Brown & Sharpe Mfg. Co., Providence, R. I.
Hill Acme Co., Cleveland
V. & O. Press Co., Hudson, N. Y.

THERMOMETERS, Dial
Brown Instrument Co., Philadelphia
Strong, Carlisle & Hammond Co., Cleveland

TOOL HOLDERS (See **HOLDERS, Tool**)

TOOL POSTS, Lathe
Armstrong Bros. Tool Co., Chicago
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Boring
Armstrong Bros, Tool Co., Chicago
Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Genesee Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Heald Machine Co., Worcester, Mass.
Illinois Tool Works, Chicago
Lucas Machine Tool Co., Cleveland
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Sturdimatic Tool Co., Detroit
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Burring
Nobur Mfg. Co., Los Angeles

TOOLS and PARTS, Cemented-Carbide
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford, Ill.
Carboloy Co., Inc., Detroit
Crafts Co. Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston and Sons, Inc., Henry, Tacony, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Grayson Mfg. Co., Monrovia, Cal.
Illinois Tool Works, Chicago
McKenna Metals Co., Latrobe, Pa.
Metal Carbides Corp., Youngstown, O.
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Sheffield Corp., Dayton, O.
Tungsten Elec. Corp., Union City, N. J.
Vanadium Alloys Steel Co., Pittsburgh
Vascoloy-Ramet Corp., Chicago
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Diamond-Tipped
Crafts Co., Arthur A., Boston
Desmond-Stephen Mfg. Co., Urbana, O.
Diamond Tool Co., Chicago
Gorton Machine Co., Geo., Racine, Wis.
Kent-Owens Machine Co., Toledo, O.
Norton Company, Worcester, Mass.
Smit & Son, J. K., N. Y. C.

TOOLS, Flexible-Shaft
Dumore Co., Racine, Wis.
Haskins Co., R. G., Chicago
Ideal Commutator Dresser Co., Chicago
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Binghamton, N. Y.
Strand & Co., N. A., Chicago
Walker-Turner, Inc., Plainfield, N. J.

TOOLS, Hand
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American Swiss File & Tool Co., Elizabeth, N. J.
Armstrong-Blum Mfg. Co., Chicago
Armstrong Bros. Tool Co., Chicago
Atkins & Co., F. C., Indianapolis
Automotive Maintenance Machy. Co., No. Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Capewell Mfg. Co., Hartford, Conn.
Carboloy Co., Detroit
Card Mfg. Co., S. W., Mansfield, Mass.
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Cleveland Twist Drill Co., Cleveland
Crafts Co., Arthur A. Boston
Dearborn Gage Co., Dearborn, Mich.
Disston & Sons, Inc., Henry, Philadelphia
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Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Greene, Tweed & Co., N. Y. C.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hamilton Tool Co., Hamilton, O.
Lufkin Rule Co., Saginaw, Mich.
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Producto Mach. Co., Bridgeport, Conn.
Racine Tool & Mach. Co., Racine, Wis.
Scully-Jones & Co., Chicago
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
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Cleveland Twist Drill Co., Cleveland
Colonial Broach Co., Detroit
Empire Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Genesee Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Hendey Machine Co., Torrington, Conn.
Illinois Tool Works, Chicago
Jefferson Mach. Tool Co., Cincinnati
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Sturdimatic Tool Co., Detroit
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

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Chicago Wheel & Mfg. Co., Chicago
Delta Mfg. Co., Milwaukee
Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine, Wis.
Foredom Electric Co., N. Y. C.
Hisey-Wolf Machine Co., Cincinnati
Rotor Tool Co., Cleveland
Schauer Machine Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

TOOLS, Portable Pneumatic
Cleveland Pneu. Tool Co., Cleveland
Onsrud Machine Works, Inc., Chicago
Rotor Tool Co., Cleveland
Sheldon Machine Co., Chicago

TOOLS, Stellite
Haynes Stellite Co., N. Y. C.

TORCHES, Gas-Cutting & Welding
Air Reduction, N. Y. C.

TRANSMISSIONS, Gear-Shift Type
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Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit

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McCrosky Tool Corp., Meadville, Pa.
Warner & Swasey Co., Cleveland

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USED MACHINERY (See Searchlight Section)

V BLOCKS (See Blocks, V)

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Barnes Co., W. F. & John, Rockford, Ill.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
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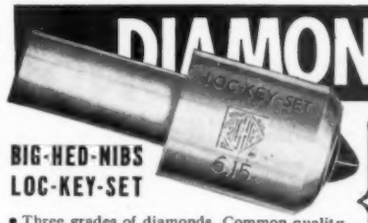

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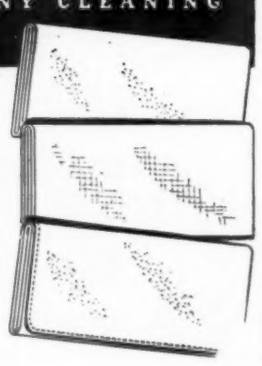

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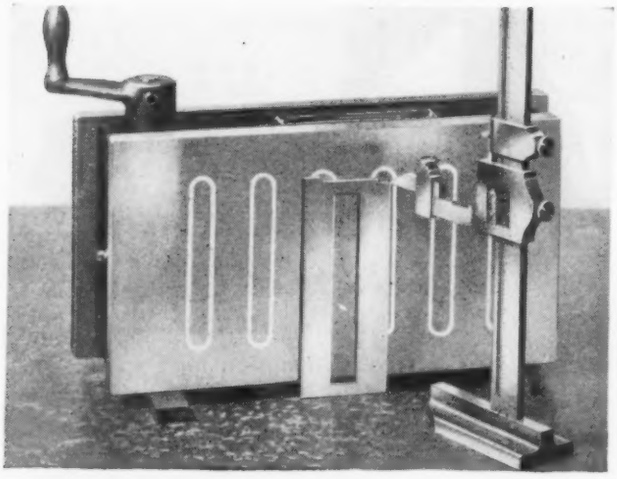

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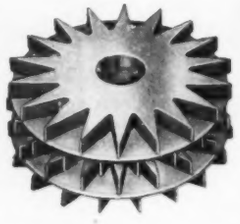

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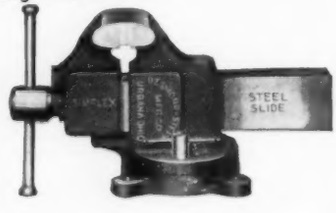

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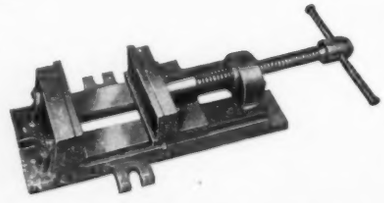

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Records made to be BROKEN!

AS an American Manufacturer you have broken many a record since Pearl Harbor, but these accomplishments will be pale achievements, compared with what you must do in '43. Faced with labor shortage, material shortage, and machine shortage, you will find ways to lick your problem — American manufacturers always do. We're turning out New Britain Automatics at a pace we think we're entitled to be proud of — and we've promised ourselves we'll do still better next year.

NEW BRITAIN-GRIDLEY • MACHINE DIVISION
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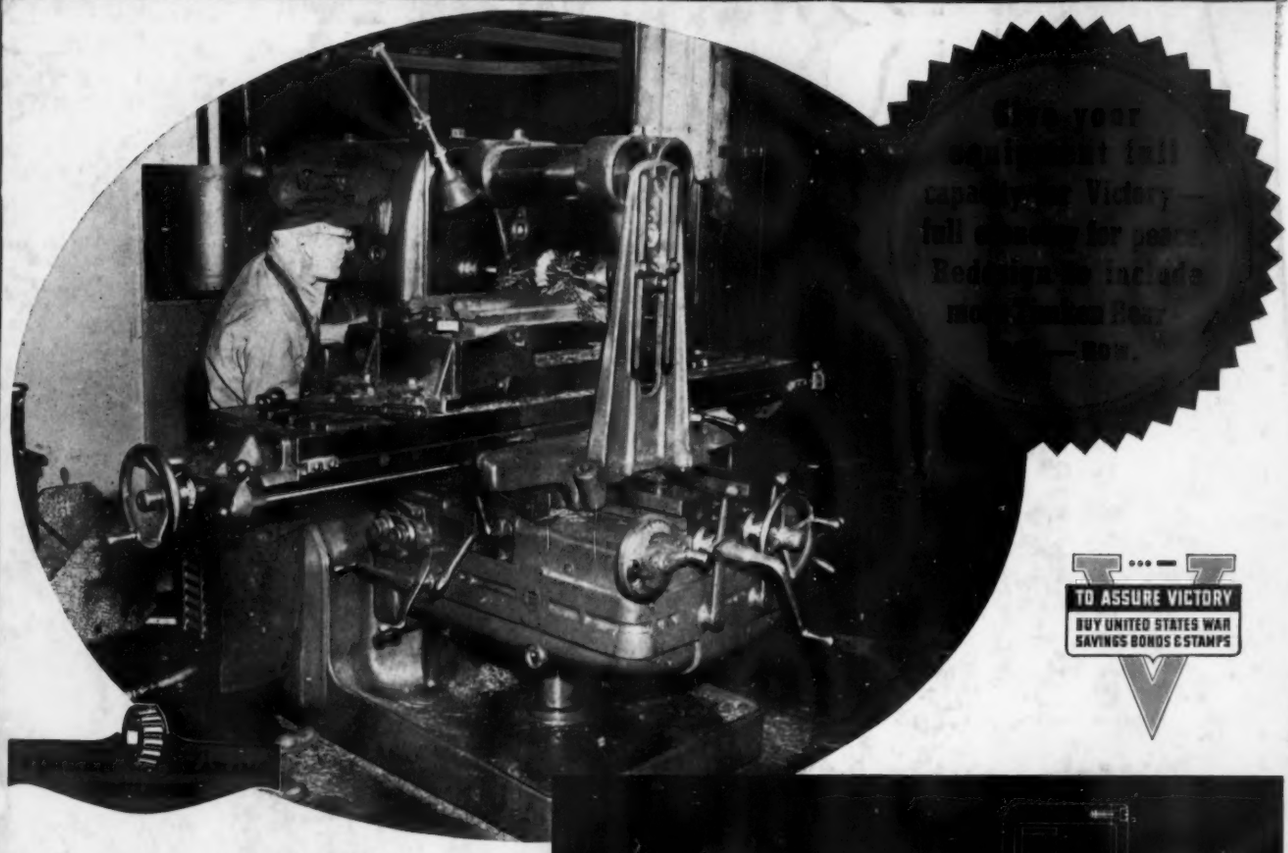
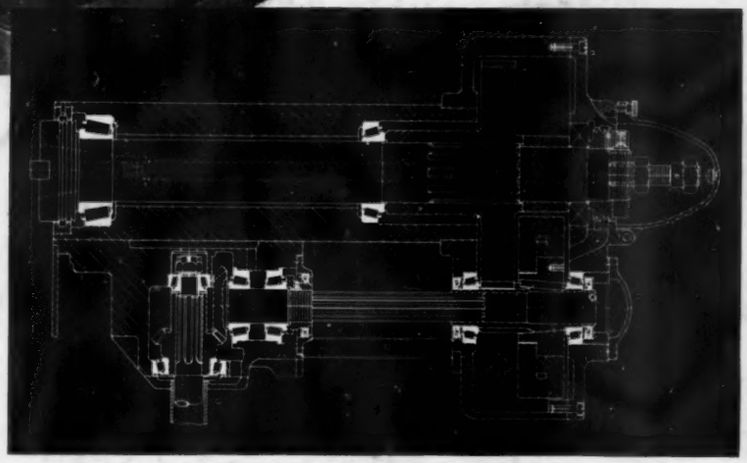


Kearney & Trecker Model K Horizontal Milling Machine with Timken Bearing Equipped spindle and gear box.



Spindle of the Kearney & Trecker Model K Milling Machine showing the application of Timken Bearings.

You never can have *too many* Timken Tapered Roller Bearings in any machine; you'll never have *enough* until you have them at every suitable bearing position.

A completely Timken Bearing Equipped machine is a completely protected machine; completely protected against friction; radial, thrust and combined loads; shock; and misalignment of moving parts. Therefore, a more accurate, more enduring, more economical machine.

No matter how efficiently a machine may operate, it still will not be profitable to its manufacturer unless it has outstanding sales appeal as well. The equipment engineer owes it to his employer to see that the machines he designs sell as well as they perform. The full use of Timken Bearings will assure both, for there is no name in bearings that means so much to the public as TIMKEN

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

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Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives, and all kinds of industrial machinery; Timken Alloy Steels; Timken Carbon and Alloy Seamless Tubing; and Timken Rotary Rock Bits.